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PHILIPPINE ZOOLOGICAL EXPEDITION 1946-1947

PHILIPPINE BATFLIES OF THE FAMILY NYCTERIBIIDAE (Diptera, Pupipara)

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The present paper deals with the Nycteribiidae¹ collected by the Philippine Zoological Expedition of Chicago Natural History Museum (1946-47) and additional specimens collected by Mr. D. S. Rabor. A few other specimens and records are also included. The expedition specimens were collected by Messrs. Harry Hoogstraal (leader of the expedition), Floyd Werner, Donald Heyneman, Manuel Celestino, Arturo Castro, Godofredo Alcasid and Dioscoro S. Rabor. I want to thank Dr. Rupert Wenzel, Curator of Insects, Chicago Natural History Museum, for placing this material at my disposal.

Ferris (1924a, b, 1925) recorded five species of Nycteribiidae from the Philippines, *Nycteribia allotopa* Speiser, *N. parvula* Speiser, *Penicillidia jenynsii* Westwood, *Eucampsipoda philippinensis* Ferris and *Cyclopodia horsfieldi* de Meijere. *Cyclopodia simulans* and *Cyclopodia ferrarii palawanensis* were described by Theodor (1959) as were two new species of *Eucampsipoda* (Theodor, 1955) which occur in the Philippines in addition to *Eucampsipoda philippinensis* Ferris.

Both *Nycteribia allotopa* and *N. parvula* are shown to consist of two different species in the Philippines and in Burma. Two new

¹ The batflies of the family Streblidae which were collected by the Philippine Zoological Expedition have been reported upon by B. Jobling (1951, Trans. Roy Ent. Soc. London, 102: 211-246).

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species of *Stylidia* are described. *Penicillidia jenynsii* is shown not to occur in the Philippines and the specimens from the Philippines previously identified as *jenynsii* are shown to represent two new species. *Basilidia majuscula* Edwards is recorded from the Philippines for the first time.

The number of species of Nycteribiidae now known from the Philippines is thus fifteen. This should not be considered final and other species and genera which occur in neighboring countries may eventually be found in the Philippines.

The descriptions are given in shortened form, except in the case of the new species.

KEY TO PHILIPPINE GENERA OF NYCTERIBIIDAE

1. Eyes absent.....2
Eyes present.....3
2. Tibiae short and wide, 2.5-3.5 times as long as wide.
Nycteribia (*Nycteribia*) Latreille
Tibiae long and slender, 4-5 times as long as wide.....*Stylidia* Westwood
3. Eyes consisting of a single unpigmented ocellus.....4
Eyes consisting of 2 ocelli on a pigmented basis.....5
4. Tibiae cylindrical, with 2 rings in the middle and short setae at their basal margin. Notopleural sutures diverging posteriorly. Haltere groove without cover. Spines of ctenidia thick and blunt, placed close together.
Eucampsipoda Kolenati
Tibiae scalpel-shaped, with 3-4 rows of long setae in the distal half of the ventral edge. Notopleural sutures converging posteriorly. Haltere groove with cover. Spines of thoracic ctenidia thin and pointed, those of the abdominal ctenidium widely spaced ordinary spines, reduced in number.
Penicillidia Kolenati
5. Head laterally compressed. Eyes consisting of 2 ocelli with a common pigmented basis. Thorax similar to that of *Nycteribia*, with nearly parallel notopleural sutures and a row of 8-15 notopleural setae. Tibiae scalpel-shaped, with long setae in the distal half of the ventral side.
Basilidia Miranda Ribeiro
Head compressed dorso-ventrally. Eyes with 2 more or less deeply separated pigmented ocelli. Thorax similar to that of *Eucampsipoda*, with notopleural sutures diverging posteriorly and 1-3 notopleural setae. Tibiae cylindrical with 3 rings in the middle and short setae at their basal margin. Parasites of Megachiroptera.....*Cyclopodia* Kolenati

Genus NYCTERIBIA Latreille, 1796

Subgenus *Nycteribia* s. str.

Nycteribia allotopa Speiser. Figures 53, 54, 56, c-f, 57, 58, 59, a-c.

Nycteribia allotopa Speiser, 1901, Arch. Naturg., 67: 47, fig. 1b; Scott, 1913, Arch. Naturg., 79 (A), Heft 8, p. 97; 1914, Ann. Mag. Nat. Hist., (8), 14:

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221; 1925, Rec. Ind. Mus., 27: 375; Ferris, 1924, Phil. Jour. Sci., 25: 397, fig. 5; Theodor, 1954, in LINDNER, Fliegen Palaearkt. Region, 66a: 15, pl. 1, figs. 1, 2, pl. 16, fig. 86; Hiregaudar and Bal, 1956, Agra Univ. J. Res. (Sci.), 5: 15, figs. 11-20.

Nycteribia insolita Scott, 1908, Trans. Ent. Soc. London, 1908: 364, pl. 18, figs. 9, 10.

The species was incompletely described from two specimens from West Sumatra. In 1908, Scott described *N. insolita* from Formosa and in 1913, after comparison with the types in the Genoa Museum, he considered it to be a synonym of *N. allotopa*. In 1924, Ferris recorded the species from the Philippines, giving new figures, and in 1954 I re-described the species.

Scott and Ferris mention a variation in the chaetotaxy of the female, viz., tergite 2 is bare on the surface in some specimens while in others it is covered with short hairs. Both forms of females were found in a long series of specimens from Formosa, in the Philippine material, in material from India near Bombay and from Burma. The marked difference between the two forms, without a series of transitions, suggested that there were in fact two species represented in the material, both of which have until now been considered as one, *N. allotopa*. The males were then examined for a second form which could be correlated with one or the other of the two types of females. The Formosa material consisted of 31 females with a bare second tergite, and 8 with a hairy tergite. All 29 males of this series belonged to a single type. The same situation was found to exist in the Bombay series, consisting of 21 females with a bare tergite, 3 with a hairy tergite and 15 males all belonging to a single type. In the material from the Philippines and Burma, however, two different types of males were found, but it was not possible to correlate them with the two types of females either statistically or by finding them with one or the other type of females in one locality only. Finally a third type of female was found, also with a bare second tergite, but with constant differences in the genital plate and in chaetotaxy. This female was found in two lots, one from the Philippines, together with the second type of male, and one from Burma, together with males of the second type only. It thus appears that the species *N. allotopa* has two types of females and that a different but closely related new species occurs together with it in some localities. This new species is described below as *N. allotopoides*.

Specimens of *N. allotopa* from various localities differ markedly in a number of characters, and the specimens from Ceylon and

Bombay as well as those from the Philippines could be described as subspecies if the exact morphology of the types from Sumatra were known. However, it has thus far not been possible to re-examine the types, and naming of the various forms must therefore be postponed.

The following description is based upon the material from Formosa, mainly because of the large number of specimens available in collections as a result of Sauter's collecting in 1906. The Burma specimens resemble the Formosa specimens closely. No material from the type locality was available.

DESCRIPTION.—Length 2.5 mm. Color yellowish brown. 9–10 notopleura setae of which the anterior ones are much shorter.

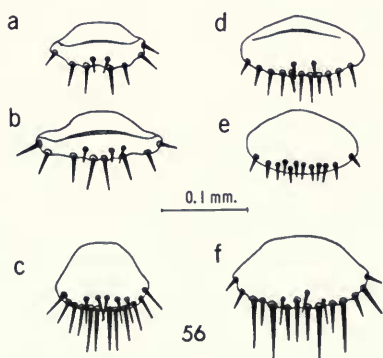
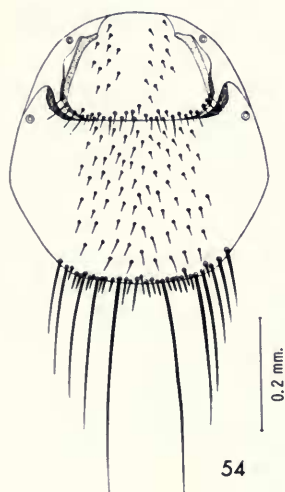
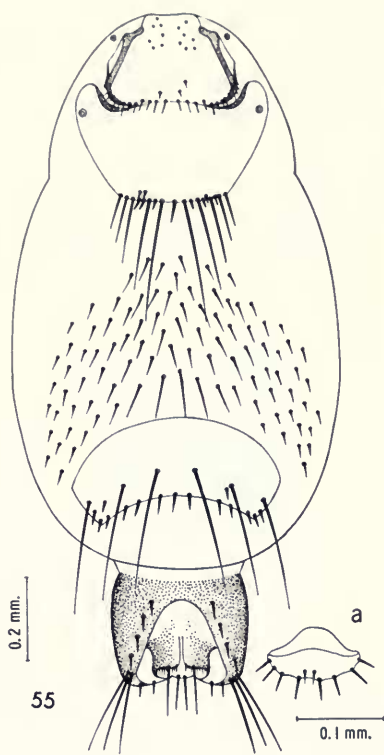
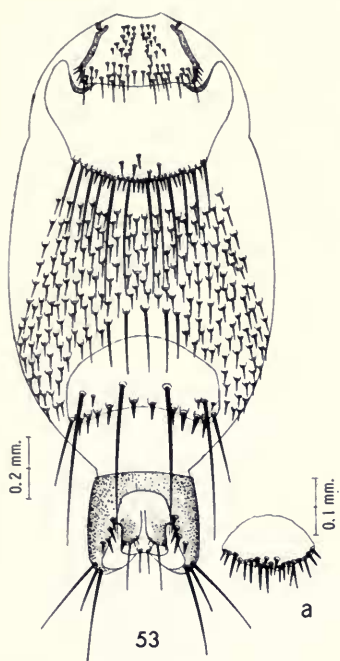
Abdomen of female: Tergite 1 with several rows of short hairs near the hind margin. Tergite 2 pentagonal, with about 12 long setae alternating with short spines at the hind margin. In most specimens the surface of the tergite is bare except for a few (1–15) short spines near the hind margin. In about a quarter of the specimens the surface of the tergite is covered with 70–80 short hairs up to the anterior margin, leaving a lateral stripe bare. Tergite 6 broad, with a curved anterior margin and 4 long vertical setae on the surface and 2 shorter horizontal setae laterally. Only short spines at the posterior margin and a few scattered on the surface. The short spines of the connexivum between tergites 2 and 6 reach up to the posterior margin of tergite 6 and there is a row of longer setae in front of tergite 6. Anal segment much narrower than the abdomen, sharply set off from it, parallel-sided, with a deep incision posteriorly at the ventral side and a longitudinal oblique row of short spines on each half of the dorsal surface. Dorsal genital plate transversely elliptical; at the posterior margin a double row of spines which are mostly shorter than the plate. Ventral plate absent. Abdominal ctenidium with 35–40 spines which are shorter in the middle.

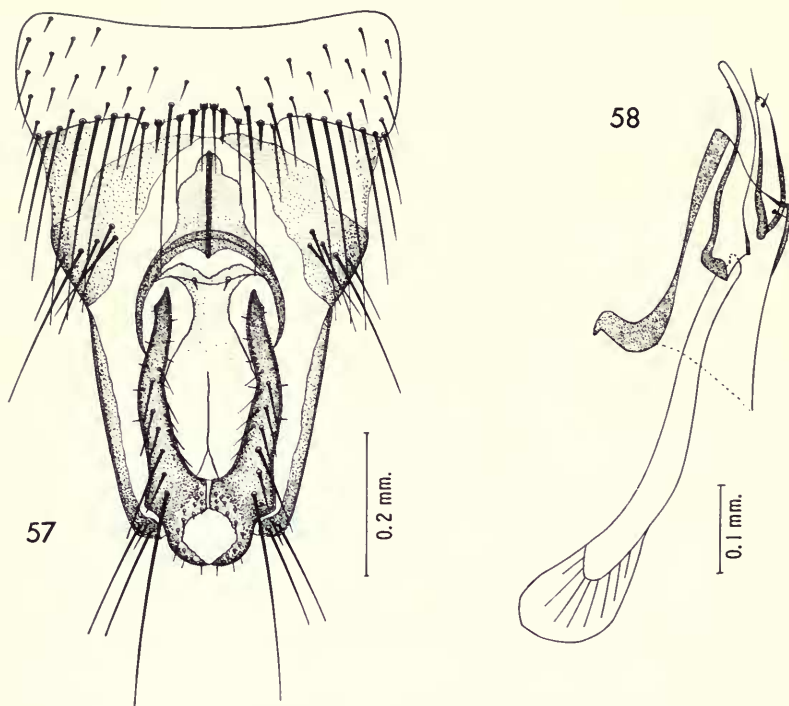
Abdomen of male: Tergites 1–4 with short hairs on the surface; these are larger and less numerous on tergites 3 and 4. The marginal rows of tergites 3 and 4 consist of moderately long, thin and short setae. The marginal rows of tergites 4–6 consist of much longer setae alternating with groups of 2–3 short spines. Anal segment long, cylindrical in its apical two-thirds, and widening at the base; it is longer than tergites 5 and 6 together. Sternite 5 with a marginal row of long setae and 4–5 spines in the middle of the hind margin. Claspers thin, curved, with pigmented tips. Aedeagus slightly curved, tapering to a blunt point. Parameres with a blunt end which carries a longer and a shorter hair.

FIGS. 53–54. *Nycteribia allotopa* Speiser; abdomen of female. (53) Dorsal aspect; *a*, dorsal genital plate. (54) Tergite 2, with hairs.

FIG. 55. *Nycteribia allotopoides*, new species; abdomen of female, dorsal aspect; *a*, dorsal genital plate.

FIG. 56. Dorsal genital plate: *a*, *b*, *N. allotopoides*, new species; *c*, *N. allotopa* from the Philippines, *d*, from Bombay, *e*, from Ceylon, *f*, from Formosa.





FIGS. 57-58. *Nycteribia allotopa* Speiser, male. (57) Sternite 5 and genital area. (58) Genitalia.

Philippine form: The males differ from Formosa specimens mainly in the aedeagus being shorter and thicker at tip and the parameres also being shorter. In the female the genital plate is narrower and more triangular in form, and some of the spines at the hind margin are longer than in Formosa females—nearly as long as the plate itself.

Ceylon and Bombay form: In this form the aedeagus is shorter than in the Formosa specimens and its end is much thinner. The parameres are also shorter and taper to a much thinner tip than in the Formosa specimens. The genital plate of the female is transversely elliptical and bears only a single row of about 12 short spines at the hind margin, with 1-2 premarginal spines in some specimens. This form will almost certainly prove to be a subspecies.

Philippine material examined.—Five females, two males, Luang-bay Cave, Sitio Tegato, Davao City Province, Mindanao, from a series collected on *Miniopterus schreibersi eschscholtzii* and *M. australis* October 22, 1946, by H. Hoogstraal; three females, four males, Miatan Cave, Katipunan, Zamboanga, collected May 19, 1952, by D. S. Rabor; three females, two males, Tablas Island, collected from *M. eschscholtzii* January, 1923, by E. H. Taylor.

Outside the Philippines, the species has been recorded from Sumatra (type locality), Japan, Formosa, Burma, Ceylon, and Bombay province.

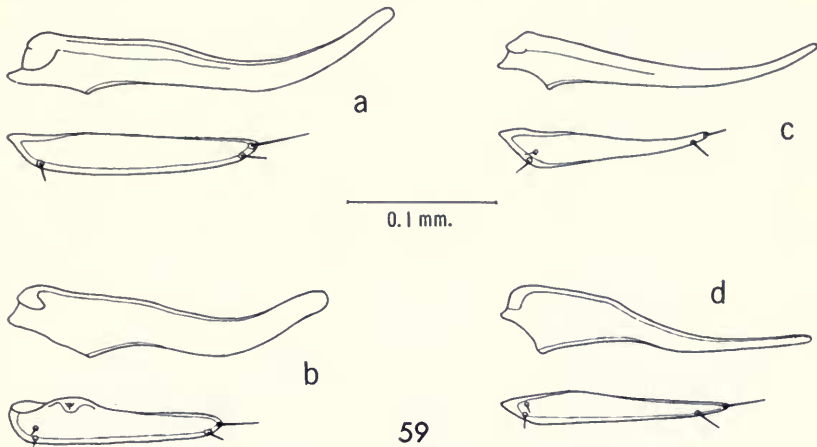


FIG. 59. Aedeagus and paramere: *a*, *Nycteribia allotopa* from Formosa, *b*, from the Philippines, *c*, from Ceylon; *d*, *N. allotopoides*, new species.

***Nycteribia allotopoides*, new species.** Figures 55, 56, *a*, *b*, 59 *d*.

The specimens are slightly smaller and more lightly colored than specimens of *N. allotopa* from the same locality. This species resembles *N. allotopa* in most characters except for the following:

In the male the aedeagus is straight with a marked dorsal bulge and it ends in a long, thin tip. The parameres are straight, tapering to a thin point, and they bear a longer seta at the tip and a shorter seta at a distance farther basally. The anal segment is shorter than in *N. allotopa*, not longer than tergites 5 and 6 together, and widens less at the base than in *N. allotopa*.

In the female all setae are shorter than in *N. allotopa*. Tergite 6 bears 6 long vertical setae on the surface and the setae anterior to tergite 6 are only little longer than the short setae of the connexivum. These do not extend posteriorly beyond the anterior margin of tergite 6. The genital plate is weakly sclerotized; it has the shape of a shallow triangle with a curved posterior margin which bears 6-8 widely spaced short spines and 1-2 smaller premarginal spines. Anal segment broader than in *N. allotopa* with a shallower incision posteriorly.

Holotype.—A male from Luangbay Cave, Sitio Tegato, Davao City Province, Mindanao, collected by H. Hoogstraal, October 22, 1946, from a mixed series of *Miniopterus australis* and *M. schreibersi eschscholtzii*. In the collection of Chicago Natural History Museum.

Allotype.—A female, same data and repository as the holotype.

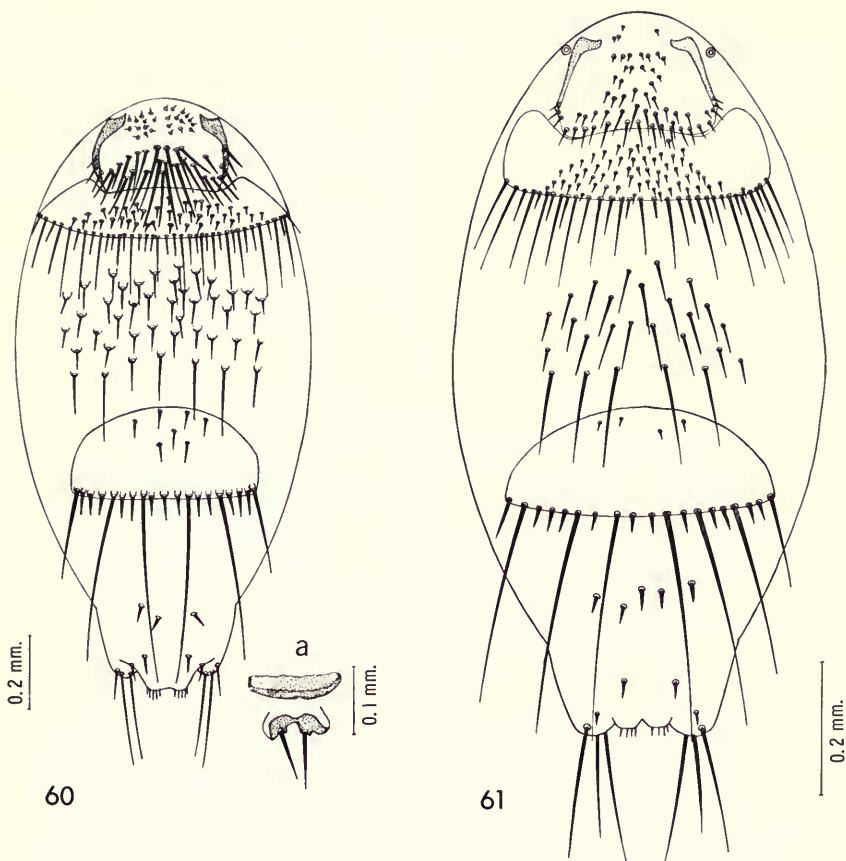


FIG. 60. *Nycteribia parvula* Speiser; abdomen of female, dorsal aspect; a, dorsal genital plate.

FIG. 61. *Nycteribia parvuloides*, new species; abdomen of female, dorsal aspect.

Paratype.—A male, same data as the holotype, in my own collection.

Other material examined.—One female and two males from Fort Ava near Mandalay, Burma, collected by G. Heinrich, November 22, 1937, from *Miniopterus* sp. In the collection of British Museum (Natural History).

***Nycteribia parvula* Speiser.** Figures 60, 62, a-c, 63, 64, 65, a-c.

Nycteribia parvula Speiser, 1901, Arch. Naturg., 67: 48; Scott, 1913, Arch. Naturg., 79 (A), Heft 8, p. 98; 1914, Ann. Mag. Nat. Hist., (8) 14: 222; 1925, Rec. Ind. Mus., 27: 376; Ferris, 1924, Phil. Jour. Sci., 25: 399, fig. 6; Theodor, 1954, in LINDNER, Fliegen Palaearkt. Region, 66a: 18,

pl. 2, figs. 13, 14, pl. 13, fig. 75, pl. 16, fig. 90; Hiregaudar and Bal, 1956, Agra Univ. J. Res. (Sci.), 5: 20, figs. 21-30.

Nycteribia sauteri Scott, 1908, Trans. Ent. Soc. London, 1908: 366, pl. 18, figs. 14-18.

The species was incompletely described from two females from West Sumatra from the same locality as *N. allotopa*. Scott (1908) described *N. sauteri* from Formosa, which he found (1913) to be identical with *N. parvula* after comparison with the types in the Genoa Museum. Ferris (1924b) records the species from the Philippines and gives new figures. Theodor (1954) gives a full re-description and figures.

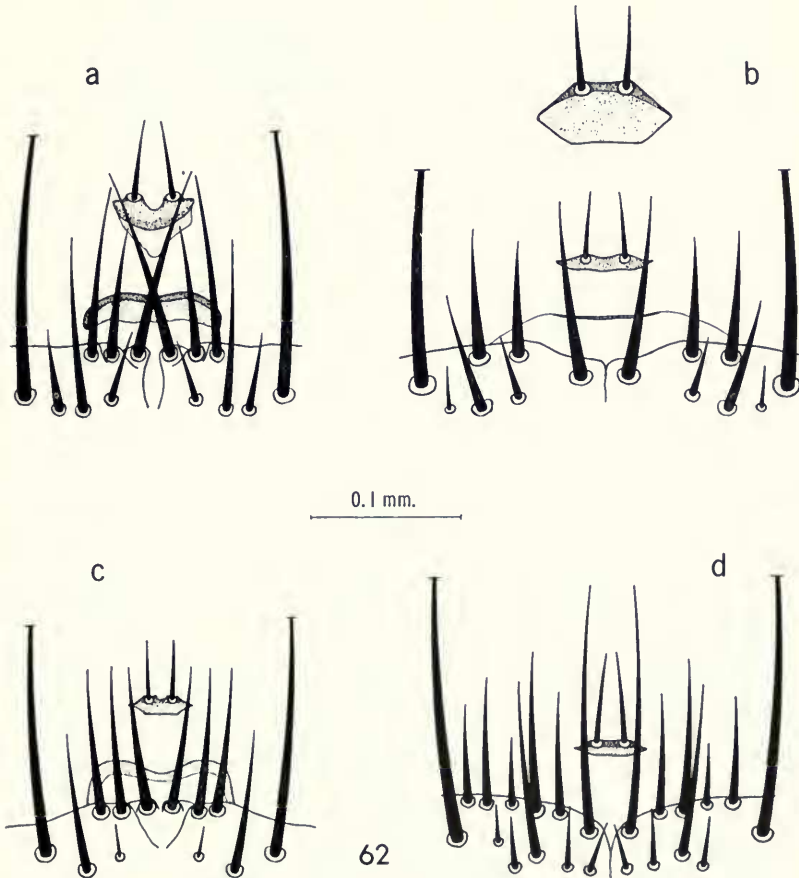


FIG. 62. Sternite 7 and genital plates of female: *a*, *Nycteribia parvula* Speiser, from Formosa, *b*, from Ceylon, (two aspects of dorsal genital plate), *c*, from the Philippines; *d*, *Nycteribia parvuloides*, new species.

As regards the formation of local forms the situation was found to be similar to that of *Nycteribia allotopa* with which *N. parvula* occurs almost constantly. In the Philippines, two forms were found occurring together. One of these is closely related to the Formosa form and may eventually prove to be a subspecies. The other form was found in a single locality only and is described below as a new species.

The exact morphology of the types is not known, but a female from West Sumatra in the collection of the British Museum (Natural History) proved to be identical with Formosa specimens, which will therefore be considered provisionally as being of the typical form.

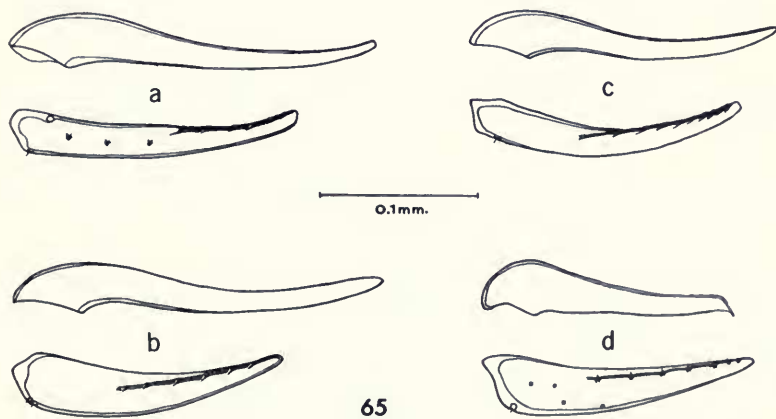
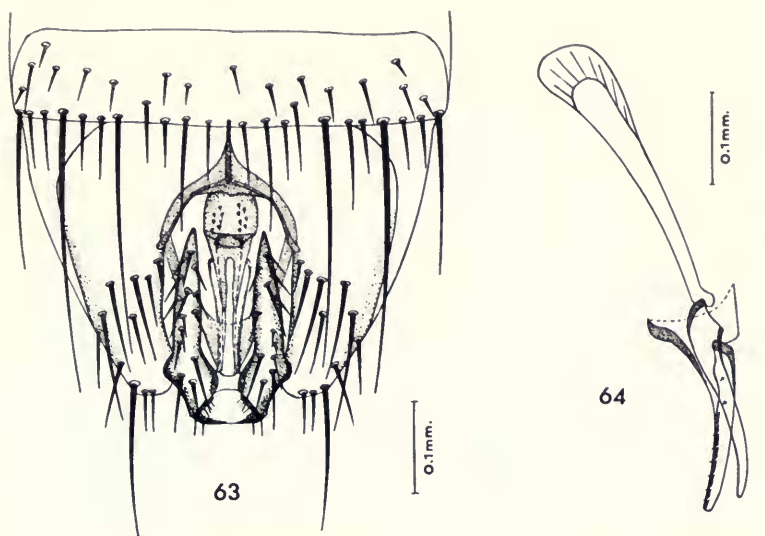
The following description is based upon about 30 specimens from the material collected by Sauter in Formosa in 1906, and about 50 specimens from Lin-Kwei, Kao hsiung, Formosa, collected in April, 1954 (Chung). Material from Burma resembles the Formosa specimens closely.

DESCRIPTION.—Length 1.5–1.75 mm. *Head* with 2 setae at the anterior dorsal margin. Mesonotum narrow; 12 notopleural setae which grow gradually shorter anteriorly, the anterior two having the form of spines. The tibiae, particularly tibiae 2 and 3, are more slender than in other species of the subgenus, tibia 3 being 3 or 3.5 times as long as wide.

Abdomen of female: Tergite 1 with several rows of moderately long setae near the posterior margin. Tergite 2 very short, with moderately long, thin setae at the hind margin and short hairs on the surface. Tergite 6 broad; at the hind margin 5–6 long setae which alternate with groups of 1–3 short spines. Only a few (4–6) short spines on the surface. 25–30 short hairs in 4–5 rows form a rounded group on the connexivum between tergites 2 and 6 and a row of longer setae anterior to tergite 6. Anal segment very short and truncate. Abdominal ctenidium with 40–44 spines. Sternite 7 with two groups of 3 closely standing setae in the middle of the hind margin, occupying approximately the width of the ventral genital plate. Dorsal genital plate with 2 setae and a more or less deep concavity between them. Ventral plate broad, curved, strongly sclerotized, without setae.

Abdomen of male: Tergites 2–3 with moderately long, thin and short setae at the hind margin and short hairs in the midst of the surface. Tergites 4–6 with 2–4 long setae in the middle of the hind margin and short spines between them. A few short hairs on the surface of tergite 4, tergites 5 and 6 bare. Anal segment very short and truncate. Sternite 5 with only setae at the hind margin, the group of spines present in most other species of the subgenus being absent. Claspers short, pointed, not pigmented. Aedeagus slender, tapering, slightly curved, with rounded tip. Parameres slender, slightly curved, tapering slowly to a blunt end. About 6 minute hairs with oblique bases along the dorsal surface.

Philippine form: Male: Differs from the Formosa form in having aedeagus and parameres shorter. *Female:* Concavity between the two setae of the dorsal genital plate shallower than in the Formosa form and the ventral genital plate weakly sclerotized. Hind margin of tergite 6 with only 4 long setae.



FIGS. 63-64. *Nycteribia parvula* Speiser, male. (63) Sternite 5 and genital area. (64) Genitalia.

FIG. 65. Aedeagus and paramere: *a*, *N. parvula* from Formosa, *b*, from Ceylon, *c*, from the Philippines; *d*, *N. parvuloides*, new species.

Ceylon and Bombay form: Male: Aedeagus slender, with narrow base. Parameres triangular with pointed tip. *Female:* Tergite 6 with 6 long setae at the hind margin. Dorsal genital plate with shallow concavity between the setae. Ventral genital plate absent. The two groups of setae at the hind margin of sternite 7 are widely spaced; the distance between the median seta and the next is greater than the distance between the two lateral setae. The setae are much shorter and thicker than in the Formosa form. The group of hairs on the connexivum between tergites 2 and 6 is triangular and consists of 16–18 hairs.

Philippine material examined.—One female, Luangbay Cave, Sitio Tegato, Davao, Mindanao, collected from *Rhinolophus arcuatus exiguus*, October 22, 1946, by H. Hoogstraal; one female, same data as the preceding, but from a collection taken on *Miniopterus australis* and *M. schreibersi eschscholtzii*; one female, five males, from Miatan Cave, Katipunan, Zamboanga, collected May 19, 1952, by D. S. Rabor; one male, one female, from Tablas Island, collected from *Miniopterus schreibersi eschscholtzii*, January, 1923, by E. H. Taylor; two females, one male, from Pagsanjan Falls, Luzon, collected from *Miniopterus schreibersi eschscholtzii* or *Chaerephon luzonus* by E. H. Taylor.

Nycteribia parvuloides, new species. Figures 61, 62, *d*, 65, *d*.

Resembling *N. parvula* in most characters but differing as follows:

In the male the aedeagus is short, with a thick base, and has a downwardly directed, short, sharp point. The parameres are triangular, with pointed end and minute hairs which have vertical bases (not oblique as in *N. parvula*) along the dorsal edge.

In the female the hairs at the posterior margin of tergite 1 are much shorter than in *N. parvula*. Tergite 6 with 6 long setae. Sternite 7 with 2 long setae near the middle of the hind margin and 4–6 shorter setae lateral to them. Dorsal genital plate very small and shallow, ventral plate absent.

Holotype.—A male from Luangbay Cave, Sitio Tegato, Davao, Mindanao, October 22, 1946, from a collection taken by H. Hoogstraal on *Miniopterus australis* and *M. schreibersi eschscholtzii*. In the collection of Chicago Natural History Museum.

Allotype.—A female, same data and repository as the type.

Paratypes.—Two males and a female, same data as the holotype; one female, same data and locality as the holotype, but from a collection taken on *Rousettus amplexicaudatus* and *Eonycteris spelaea glandifera*.

Other material examined.—Two males, two females, from Fort Ava, near Mandalay, Burma, collected by G. Heinrich from *Miniopterus* sp. Two males, one female, from Nicobar Islands, taken from

Miniopterus pusillus. In the collections of the British Museum (Natural History) and the author.

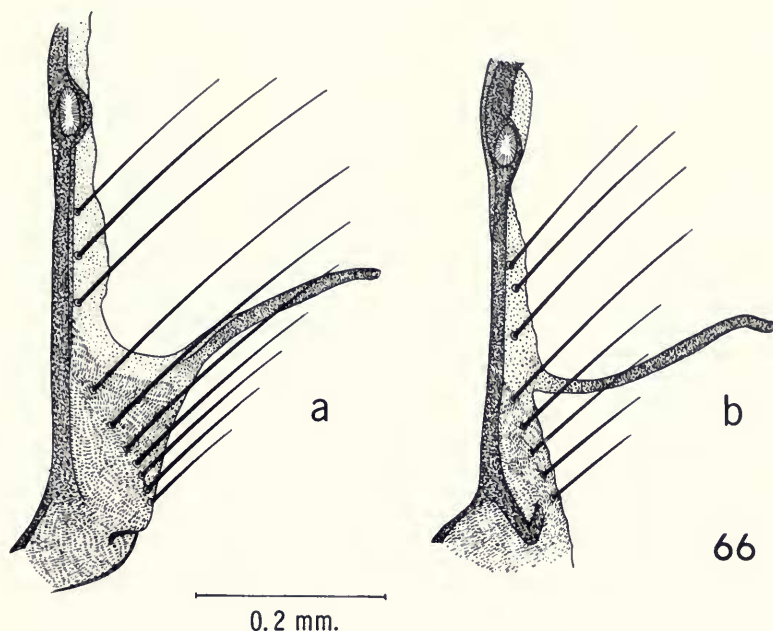


FIG. 66. Lateral plate of notopleural suture: *a*, *Stylidia mindanaensis*, new species; *b*, *Stylidia brachyacantha*, new species.

Genus *STYLIDIA* Westwood, 1840

Stylidia mindanaensis, new species. Figures 66, *a*, 67, 68.

This new species belongs to the *biarticulata* group of species, which have several setae at each side of the posterior margin of the sternal plate of the thorax. The arrangement of the group of spines on sternite 5 in combination with the structure of the genitalia differentiates this species clearly from other species of the genus. From *S. brachyacantha*, in particular, it differs by the presence of longer spines in the posterior row on sternite 5, and by the shape of the aedeagus and of the parameres, whose rounded ends bear a brush of hairs.

DESCRIPTION.—Length 2.5 mm. Color brown. *Head* sclerotized up to the anterior dorsal margin, which bears 4 setae. A row of short setae at the anterior ventral margin and a few on the genae. Palps slender with a long terminal seta. Labella of the labium shorter than the theca.

Thorax slightly longer than wide. Mesonotum narrow. 11 notopleural setae of which the 5 anterior ones are widely spaced and the posterior ones stand closely together. Lateral plate of the notopleural suture broad behind the mesopleural suture. Median ventral suture widened in the middle. Oblique sutures form an angle of 70°. Posterior margin of the sternal plate concave in the middle with 3 setae at each of the lateral bulges, the middle one of the setae longer than the others. Tibiae slender, scalpel-shaped, with pointed ends. They are 5-5.5 times as long as wide. Tibia 1 with a group of short spines at the basal part of the anterior surface.

Abdomen of male: Tergite 1 with a row of moderately long setae at the hind margin and some minute hairs on the surface. Tergite 2 with moderately long and shorter setae at the hind margin and short setae in the middle of the surface. Tergite 3 similar but with less setae on the surface. Tergite 4 similar but marginal setae more widely spaced. Tergite 5 with convex posterior margin and 2 long setae in the middle of the marginal row. Tergite 6 with more strongly convex hind margin and a similar marginal row. Surface of tergites 5 and 6 bare, except for 2-3 short setae. Anal segment very long, conical, with 4 setae on the posterior part of the dorsal surface and a row of 6 setae at the posterior margin of which nos. 2 and 5 are very long. Sternite 1 + 2 with 3-4 rows of short setae on the surface and a ctenidium of 42 spines of which the median ones are shorter. Sternites 3 and 4 with marginal rows of moderately long and shorter setae and minute hairs on the surface. Sternite 5 slightly convex posteriorly. A triangular group of about 40 spines in three rows at the middle of the posterior margin. The spines of the posterior row are long or very long and those of the anterior row very short. Some long and shorter setae at the posterior margin laterally and a pre-marginal row with 4 long and some short setae.

Genitalia: Claspers very long, pigmented along their entire length, curved. A long seta dorsally near the base and a row of shorter setae at the outside nearly up to the tip. A row of minute hairs at the median side. Basal arc triangular. Phallobase strongly concave dorsally. Aedeagus conical, straight, with a short dorsal tooth. Apodeme long, with a broad end-plate. Parameres slender, curved, each with a dense group of short hairs at the rounded tip and a row of similar hairs along its length.

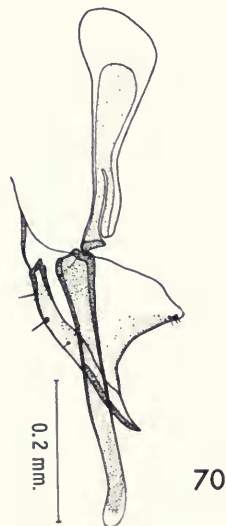
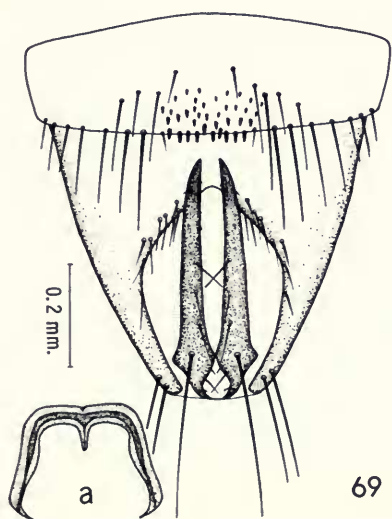
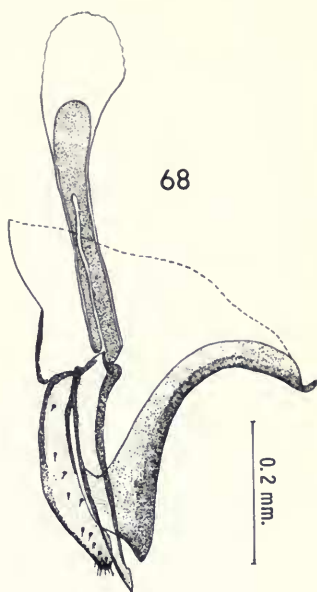
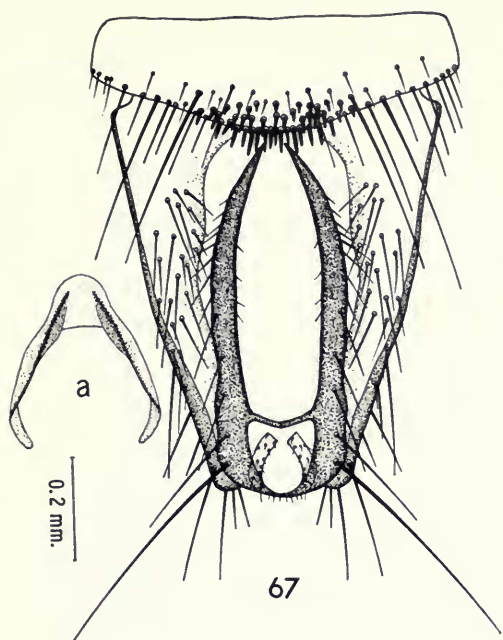
Female unknown.

Holotype.—A male, collected by H. Hoogstraal in Luangbay Cave, Sitio Tegato, Davao, Mindanao, October 22, 1946, without host data. In the collection of Chicago Natural History Museum.

Styldia brachycantha, new species. Figures 66, *b*, 69, 70.

This new species also belongs to the *biarticulata* group of the genus. It differs from other species of the genus by the characteristic shape of the aedeagus, which is nearly parallel-sided with a rounded, membranous end, and by the arrangement of the group of spines on sternite 5 in 4-5 rows, all spines being very short.

DESCRIPTION.—Length 2.5 mm. Color brown. *Head* sclerotized up to the anterior dorsal margin, which carries 6 setae, the outer pairs standing close to-



FIGS. 67-68. *Stylidia mindanaensis*, new species, male. (67) Sternite 5 and genital area; a, basal arc. (68) Genitalia.

FIGS. 69-70. *Stylidia brachyacantha*, new species, male. (69) Sternite 5 and genital area; a, basal arc. (70) Genitalia.

gether. Short setae at the anterior ventral margins. Genae bare. Palps short and thick, with a long terminal seta. Labella of labium only slightly shorter than the theca.

Thorax markedly longer than wide, with 6-9 notopleural setae, the row reaching anteriorly halfway between the mesopleural suture and the anterior spiracle. The anterior notopleural setae more widely spaced than the posterior ones. The lateral plate of the notopleural suture very narrow behind the mesopleural suture. Median ventral suture not much widened in the middle. Oblique sutures forming an angle of 60°. Thoracic ctenidium with 16 very long and thin spines. Posterior margin of the sternal plate with 3 setae at each lateral bulge. Legs shorter than in the preceding species. Tibiae 4 times as long as wide, scalpel-shaped, with 3 rows of setae at the distal part of the ventral surface. The distal end of the tibiae is more sharply curved than in *S. mindanaensis*. The group of small spines on the basal part of the anterior surface of tibia 1 consists of only 12 spines.

Abdomen of male: Tergite 1 with a row of short spines at the posterior margin. Tergites 2 and 3 divided in the middle, with a marginal row of moderately long setae. The lateral sclerites of tergite 2 are covered with small spines in the greater part, those of tergite 3 in the median thirds only. Tergites 4-6 undivided, concave posteriorly, with similar marginal rows, with two long setae in the middle of the marginal row on tergites 4 and 5 and two very long setae on tergite 6. There is a group of short spines in the middle of the surface of tergite 4, only a few on tergite 5 and tergite 6 is bare. Anal segment short, conical, with a deep concavity in the anterior dorsal margin. A transverse row of 6 short setae on the dorsal surface, and 4 longer setae at the posterior margin. Sternite 1 + 2 small, with 2-3 rows of short setae on the surface and a ctenidium of 40 spines. Sternites 3 and 4 with marginal rows of long and shorter setae. Sternite 3 with numerous short spines on the surface, sternite 4 with only 1-2 rows of longer setae; sternite 5 with nearly straight posterior margin. There are 4-5 rows of very short spines in the middle of the posterior part of the surface, those of the last row on the hind margin little longer than those of the anterior rows. At the sides of the hind margin stand longer setae which become gradually shorter laterally. There is a pre-marginal row of 8 setae, the outer pairs being long.

Genitalia: Claspers straight, short, with pigmented points. A long seta dorsally near the base and 3 shorter setae up to the middle. There are some minute hairs in the distal half. Basal arc rounded, with a posterior process. Aedeagus straight, slightly conical in the basal half, nearly parallel-sided in the apical half, with a rounded tip. Apodeme nearly as long as aedeagus. Phallobase concave dorsally, fused with the parameres. Parameres with long, slender, curved apical process and 3 short hairs near the base.

Female unknown.

Holotype.—A male from Caburan, Davao, Mindanao, collected in cave without host data, January 14, 1947, by H. Hoogstraal. In the collection of Chicago Natural History Museum.

Paratype.—A male, same data as the holotype, in the collection of the author.

Genus *BASILIA* Miranda Ribeiro, 1903*Basilia majuscula* (Edwards). Figures 71–74.

Penicillidia fletcheri var. *majuscula* Edwards, 1919, Jour. Fed. Malay S. Mus., 8: 58.

Penicillidia longiseta Schuurmans Stekhoven and Hardenberg, 1938, Cap. Zool., 8: 30, figs. 43–52.

Penicillidia rotundisquamata Schuurmans Stekhoven, 1942, Zeitschr. Parasitenk., 12: 513, figs. 10–21.

Basilia majuscula, Theodor, 1956, Parasitology, 46: 373, figs. 29–32.

This species was described very briefly by Edwards as a variety of *Basilia fletcheri*. *B. majuscula* belongs to the *bathybothyra* group of the genus *Basilia*, which has been revised recently (Theodor, 1956). A full description of *B. majuscula* is given in this revision.

DESCRIPTION.—Length 2.2–2.5 mm. *Head* laterally compressed, with 3–4 setae at each side of the anterior dorsal margin. Eyes with a common, pigmented base and two small, well-marked ocelli. Labella of the labium about half the length of the theca.

Thorax wider than long. 6–9 notopleural setae. Tibiae scalpel-shaped, 4 times as long as wide. 3 rows of setae in the distal half of the ventral surface.

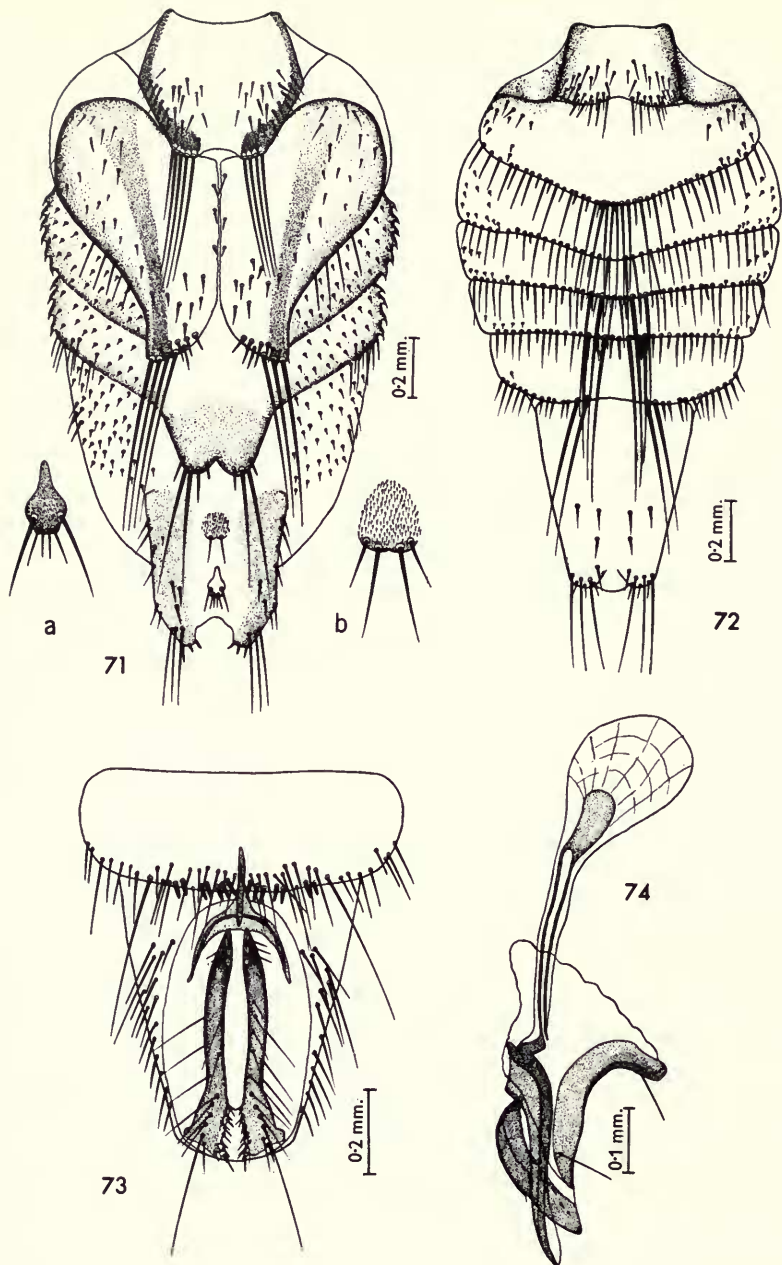
Abdomen of female: Each posterior lobe of tergite 1 with a group of 3–6 long setae. Tergite 2 heart-shaped with broadly rounded posterior lobes, each of which bears 3 very long and thick setae directed obliquely laterally and posteriorly. Near their bases 6–7 short spines. Distribution of spines on tergal plate 2 as in figure 71. Tergal plate 3 with two blunt processes bearing 1–2 long setae and 2–3 short spines. Anal segment long, nearly parallel-sided, carrying short setae laterally and short spines at the posterior processes. Abdominal ctenidium with 65–75 spines. Anal sclerite drop-shaped with 2 longer and some shorter setae. Genital plate weakly sclerotized, consisting of a field of minute hairs and 3–5 setae posteriorly.

Abdomen of male: Tergite 2 triangularly produced in the middle of the posterior margin and carrying there 6–8 longer setae. Surface of tergites 2–5 bare except for 10–14 minute spines laterally. Tergite 6 bare, 2–4 very long and thick setae in the marginal rows of tergites 4–6. A gap in the middle of the marginal row of tergite 6. Sternite 5 with a double row of 9–12 spines in the middle of the hind margin. Anal segment conical, with 6–8 spines in the posterior part of the dorsum.

Genitalia: Claspers long and thin, pigmented. Aedeagus long, slightly curved, tapering to a point. Parameres slender, curved, with blunt distal end and a row of about 6 minute hairs along the dorsal edge.

Philippine material examined.—Four males, four females from Puerto Princesa, Palawan Island, collected from *Pipistrellus imbricatus*, April 1–3, 1947, by F. Werner and A. Castro.

Distribution and hosts.—This species is known from Sumatra (type locality), from *Vespertilio* sp.; Java, from *Tylonycteris pachypus* and *Pipistrellus tralaticus*; and India, near Bombay.



FIGS. 71-74. *Basilia majuscula* (Edwards). (71) Abdomen of female, dorsal aspect; a, anal sclerite; b, genital plate. (72) Abdomen of male, dorsal aspect. (73) Sternite 5 and genital area of male. (74) Genitalia of male. (After Theodor, 1956.)

Genus *PENICILLIDIA* Kolenati, 1863

Penicillidia jenynsii (Westwood). Figures 75, *a-b*, 76, 80, 84.

Nycteribia jenynsii Westwood, 1835, Trans. Zool. Soc. London, 1: 291, pl. 36, figs. 29-34.

Penicillidia jenynsii (Westwood), Scott, 1908, Trans. Ent. Soc. London, 1908: 360, pl. 18, figs. 1-8; 1913, Arch. Naturg., 79 (A): 92; Theodor, 1954, in LINDNER, Fliegen d. Palaearkt. Region, 66a: 39, pl. 7, figs. 46, 47, pl. 15, fig. 85, pl. 18, fig. 105 (nec *Penicillidia jenynsii*, Speiser, 1901, Arch. Naturg., 67: 38; nec Scott, 1914, Ann. Mag. Nat. Hist., (8), 14: 213 [Ceylon Record]; nec Ferris, 1924, Phil. Jour. Sci., 25: 400, fig. 7).

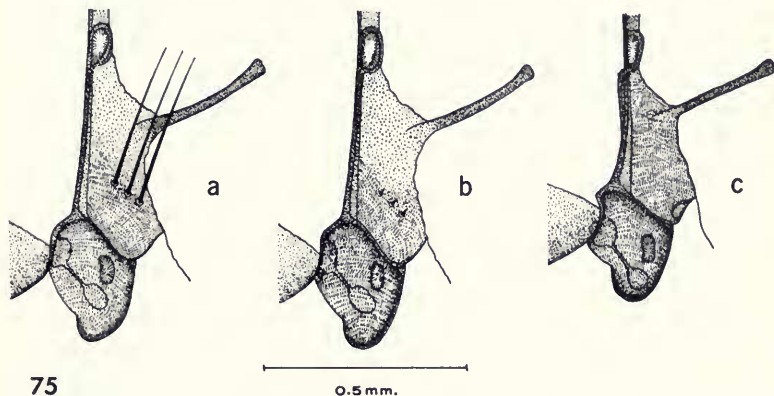


FIG. 75. Lateral plate of notopleural suture: *a*, *Penicillidia jenynsii* (Westwood), female, with long setae; *b*, *P. jenynsii*, male, with short spines; *c*, *P. oligacantha*, new species, without spines or setae.

Penicillidia jenynsii was described by Westwood from China in 1835. The type is apparently lost. In 1901, Speiser described males from Sumatra which he considered as *P. jenynsii*. Both the original description and Speiser's description are incomplete and would fit any species of this group of *Penicillidia*. In 1906 Sauter collected in Formosa the rich material which was described by Scott in 1908 and forms the basis of our knowledge of *P. jenynsii* today. No specimens from China have been available for examination, but it is probably justifiable to consider the Formosa material as typical, particularly as it is identical with material from Japan. Re-examination of a Sumatra specimen of the series which Speiser considered as *P. jenynsii* proved that this is not identical with it but is closely related to one of the new species described here. Scott (1914) considered specimens from Ceylon as *jenynsii*, but in 1925 he created the variety *indica* for the Ceylon form. This was raised to specific rank in 1954

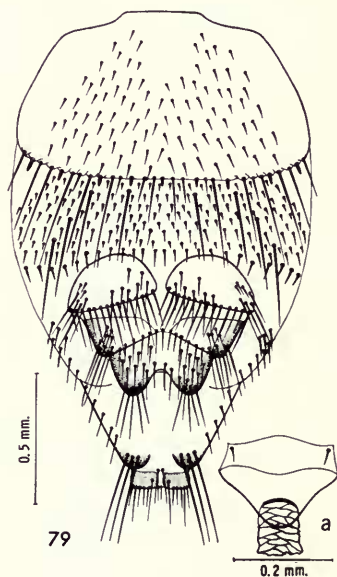
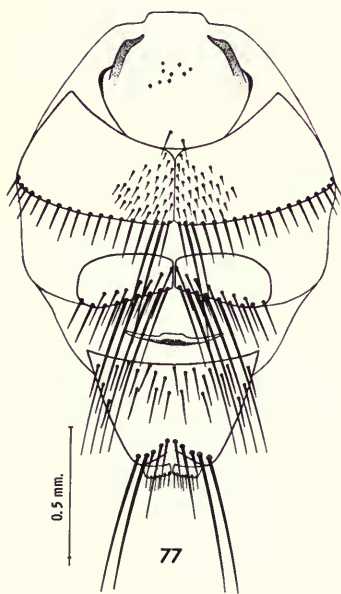
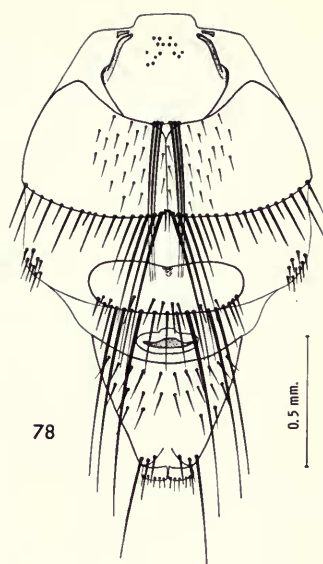
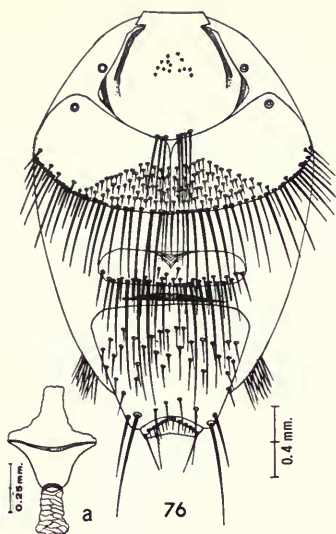


FIG. 76. *Penicillidia jenynsii* (Westwood); abdomen of female, dorsal aspect; a, genital plate.

FIG. 77. *P. oligacantha*, new species; abdomen of female, dorsal aspect.

FIGS. 78-79. *P. oceanica acuminata*, new subspecies; abdomen of female. (78) Dorsal aspect. (79) Ventral aspect; a, genital plates.

by Theodor. Ferris (1924b) recorded *jenynsii* from the Philippines, in error. Examination of the Philippine material, including some of Ferris' material, showed that the Philippine specimens differ from *jenynsii* in a number of characters and that the material consists of two new species, one more closely related to *jenynsii* and the other to *P. oceanica* Bigot. *P. jenynsii* thus seems to be restricted to China, Japan, and Formosa. A redescription of the species has been given by Theodor (1954).

The main characters which distinguish *P. jenynsii* from the two new species described here are as follows: there are 1-3 long notopleural setae in the female and 1-3 short notopleural spines in the male; in the female, there are two groups of 2-5 moderately long setae in the middle of the hind margin of tergite 1 and they reach to the hind margin of tergite 2, while in *P. oligacantha* there are only 1-2 short setae, and in *P. oceanica acuminata* there are two groups of setae which are much longer than in *P. jenynsii*. The dorsal genital plate in *P. jenynsii* is narrow and without any spines or setae at the base. In the male the chaetotaxy of sternite 5 is different and there are some differences in the structure of aedeagus and parameres.

Penicillidia oligacantha, new species. Figures 75, c, 77, 81, 83, a, 85.

P. jenynsii Ferris (pro parte), 1924, Phil. Jour. Sci., 25: 400 (nec Westwood, 1835).

This species resembles *P. jenynsii*, but differs in the following points: The row of short setae at the anterior ventral margin of the head is double in its dorsal part, not single as in *P. jenynsii*. Notopleural setae are absent. The group of spines on sternite 5 of the male is undivided, and the lateral spines are much shorter than in *P. jenynsii*. The distribution of teeth on the ventral surface of the aedeagus is different and the parameres are of different form. In the female, tergite 1 bears two groups of moderately long setae in the middle of the hind margin in *P. jenynsii* while in *P. oligacantha* there are only 1-2 short setae in most specimens, which may be absent. Tergal plate 3 is undivided in *P. jenynsii* and the dorsal genital plate is narrower and without setae at the base.

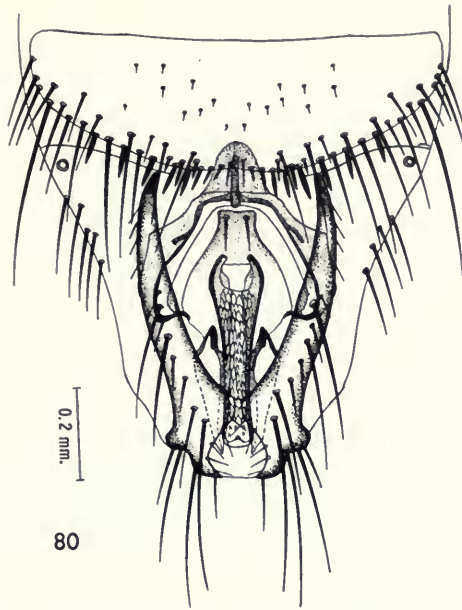
DESCRIPTION.—Length 2.5-3 mm. Color brown. Head broadly rounded, with a dense group of setae between the eyes. A double row of short setae at the anterior ventral margin of the head. Palps with a long terminal seta and several long setae near the tip. Labella of labium very short, about half the length of the theca.

Thorax wider than long. Oblique sutures fused. No notopleural setae. Tibiae slender, 5-6 times as long as wide, with 3 rows of setae at the distal part of the ventral surface. The distal row reaches beyond the tip of the tibia.

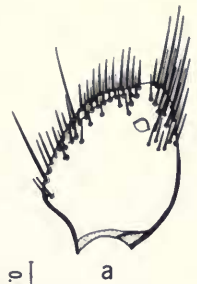
Abdomen of female: Tergite 1 rounded posteriorly, either without any setae or with 1-2 short setae near the middle of the posterior margin. Surface bare except for a few minute spines anteriorly. Tergal plate 2 rounded posteriorly, divided in the middle, with a marginal row of rather short setae and some long setae near the median division line. These setae are not as long as those of tergal plate 3. The middle of the surface of tergal plate 2 is covered with short hairs in some specimens, in others the hairs extend to the sides of the surface, and in still others the surface is completely bare. (It has to be noted that these small hairs may be rubbed off in some specimens, but their bases can always be made out under high magnification.) Tergal plate 3 divided into 2 elliptical sclerites with a marginal row of 3-4 very long setae toward the middle and short setae laterally. A pre-marginal row of short setae. Anal segment conical, with short setae on the dorsal surface and a row of long setae posteriorly. Between tergal plate 3 and the anal segment there is a sclerotized strip which is possibly the remnant of a tergite. Sternite 1 + 2 large, covered with short hairs and with a ctenidium of about 20 short ordinary spines which are smaller and stand wider apart in the middle; there may be a gap in the middle of the ctenidium which bears setae instead of spines; a pre-marginal row of long setae. Sternite 3 membranous, with 5 rows of short setae and a curved row of 6 long setae on the surface. Sternite 4 similar, but with only 2 rows of short setae and a single long seta at each side of the surface. Sternite 5 with 2 elliptical sclerites covered with short setae and some vertical long setae in the pre-marginal row, particularly laterally. Sternite 6 undivided, with 3 rows of setae which are long and stand vertically in the lateral parts of the surface. Sternite 7 with 2 rounded processes covered with setae which are long posteriorly. Dorsal genital plate broad, triangular, with 2 short setae laterally near the base. Ventral plate small, irregularly rectangular, without setae.

Abdomen of male: Tergites 1 and 2 fused. Tergite 2 with a dense marginal row of thin, moderately long setae. Tergites 3-6 short, with similar marginal rows but in addition with 4-6 very long and thick setae in the middle of the marginal rows which are longest on tergites 3 and 4. Surface of the tergites covered with small hairs. Anal segment conical, with short setae in the posterior part of the dorsum and 2 long setae in the posterior lateral corners. Sternite 1 + 2 shorter than in the female, with a ctenidium of about 30 short, ordinary spines, which are longer and stand more closely together than in the female; the median are shorter than the lateral spines; a pre-marginal row of long setae and a few long setae lateral to the ctenidium. Sternites 3 and 4 with marginal rows of short setae of different length and with pre-marginal rows of long setae and an additional row of short setae laterally. Sternite 5 similar, slightly longer than 4, with a shallowly convex posterior margin; a group of about 30 short spines in 2-3 rows at and near the middle of the posterior margin, those of the anterior row shorter; the lateral spines only slightly longer than the median ones; a row of long setae lateral to the group of spines at the hind margin and 1-2 rows of shorter setae anterior to the group of spines.

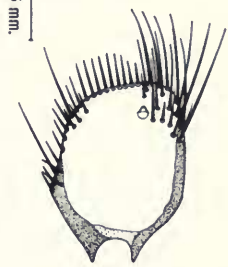
Genitalia: Claspers long, thin, curved, with pigmented tips. A long seta dorsally near the base, another farther apically and 2-3 rows of shorter setae in the basal two thirds. Basal arc triangular, with narrow lateral flaps. Aedeagus curved



80

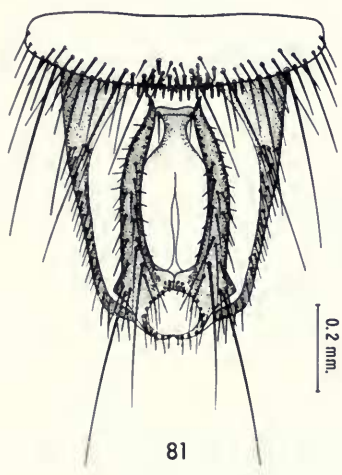


a

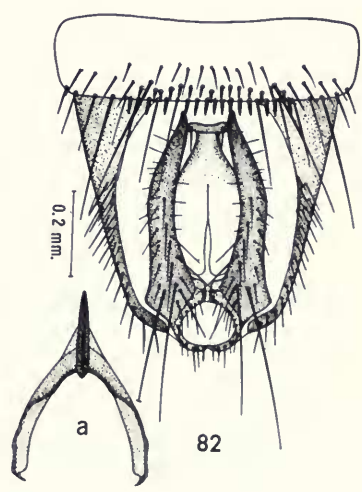


b

83



81



a

82

FIGS. 80-82. Sternite 5, and genital area of male. (80) *Penicillidia jenynsii* (Westwood). (81) *P. oligacantha*, new species. (82) *P. oceanica acuminata*, new subspecies; a, basal arc.

FIG. 83. Head, lateral view: a, *P. oligacantha*, new species; b, *P. oceanica acuminata*, new subspecies.

in profile with a long dorsal tooth at the tip. In dorsal view it is nearly parallel-sided in the distal part, with broadly rounded end. In its basal two thirds, its ventral surface bears teeth which are more marked in 2 lateral longitudinal stripes. In *P. jenynsii* these teeth are uniformly distributed all over the ventral surface. Parameres triangular, with a blunt tip and a row of short setae along the dorsal edge.

Holotype.—A male from Luangbay Cave, Sitio Tegato, Davao, Mindanao, collected from a mixed series of *Miniopterus australis* and *M. schreibersi eschscholtzii*, October 22, 1946, by H. Hoogstraal. In the collection of Chicago Natural History Museum.

Allotype.—A female, same data and repository as the holotype.

Paratypes.—Two males and a female, same data as the holotype. A female, same data as the holotype but from a mixed collection of *Rousettus amplexicaudatus* and *Eonycteris spelaea glandifera*; a male and female, same data as the holotype but from bat dung; a female, same data but from *Rousettus amplexicaudatus*, collected by H. Hoogstraal *et al.* In the collections of Chicago Natural History Museum and the author.

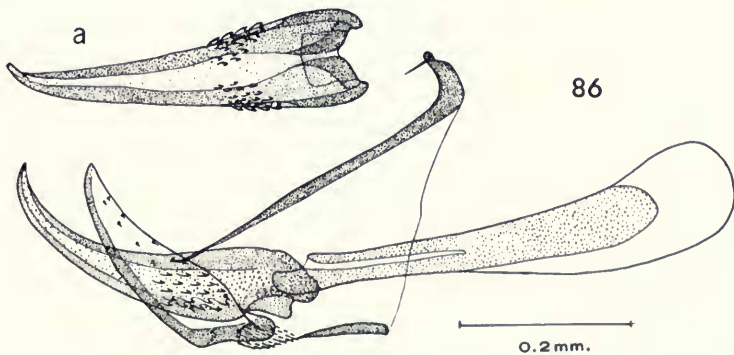
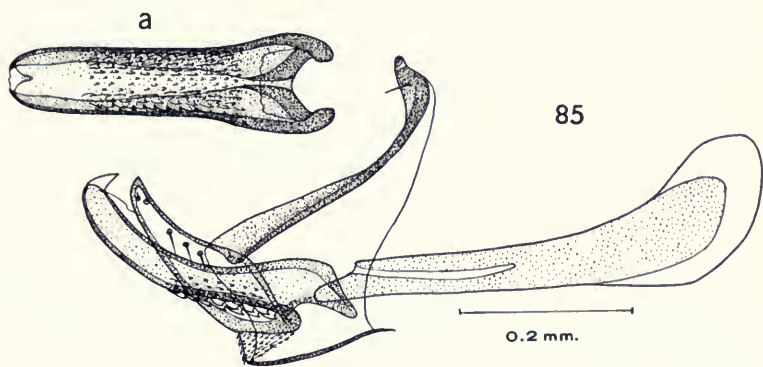
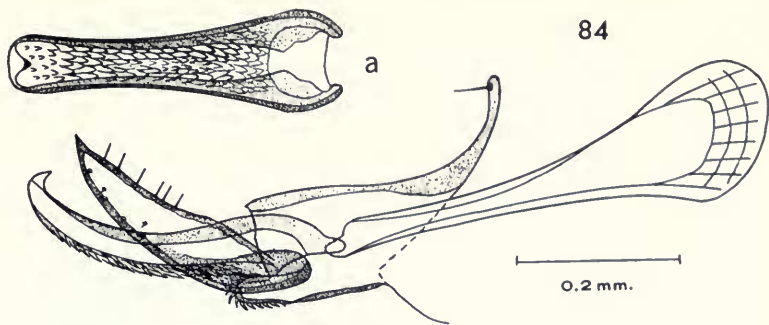
Other material examined.—Seven males and 12 females from Tablas Island, from *Miniopterus schreibersi eschscholtzii*, collected January, 1923, by E. H. Taylor. A female from Irisan, Benguet Province, from *Rhinolophus arcuatus*. In the collections of U. S. National Museum.

Remarks.—A male of the series from Lian si Paghe in West Sumatra from the collection of the Genoa Museum which was used by Speiser (1901) for his redescription of *P. jenynsii* was re-examined and proved to be not *P. jenynsii* but closely related to *P. oligacantha*. It differs in minor details in the genitalia. More material of both sexes of this form is necessary in order to define its position.

Penicillidia oceanica acuminata, new subspecies. Figures 78, 79, 82, 83, b, 86.

P. jenynsii Ferris (pro parte), 1924, Phil. Jour. Sci., 25: 400 (nec Westwood, 1835).

Like *P. oligacantha*, *P. oceanica acuminata* differs from *P. jenynsii* in the absence of notopleural setae. It also differs in the arrangement of the spines on sternite 5 and in the shape of the aedeagus and parameres in the male and in the shape of the genital plate in the female. It differs from *P. oligacantha* in the presence of long setae on tergite 1, the longer setae on tergal plate 2, and the undivided tergal plate 3. In the male the differences are mainly in the genitalia and the arrangement of the group of spines on sternite 5.



FIGS. 84-86. Genitalia of male; a, aedeagus, dorsal aspect. (84) *Penicillidia jenynsii* (Westwood). (58) *P. oligacantha*, new species. (86) *P. oceanica acuminata*, new subspecies.

P. oceanica acuminata differs from the typical subspecies mainly in details of the male genitalia. It resembles *P. oligacantha* superficially and in the following description the differences between the two species will be stressed.

DESCRIPTION.—*Head:* Only a single row of short setae at the anterior ventral margin near the eyes. (A double row in *P. oligacantha*.) *Thorax:* Notopleural setae absent. Legs and particularly tibiae longer and more slender than in *P. oligacantha* as a rule.

Abdomen of female: Tergite 1 with a group of 2–8 long, curved setae in the middle of the posterior margin, which may be separated into 2 groups by a narrow gap. These setae are much longer than in *P. jenynsii*. The long marginal setae of tergal plate 2 near the middle are as long and thick as those of tergal plate 3. This is undivided, broad, and has a marginal row of very long and thick setae in the middle and shorter setae laterally; 1–2 rows of premarginal setae. Abdominal ctenidium even more reduced than in *P. oligacantha*. It consists of 12–14 short spines with a wide gap in the middle and long setae between the spines. Dorsal genital plate triangular, broad, with 2 short setae near the base.

Abdomen of male: The long setae on tergites 3–6 are more numerous and more widely spread than in *P. oligacantha*. Abdominal ctenidium with about 20 spines. The median spines are much smaller than the lateral ones and more widely spaced. Sternite 5 with straight posterior margin. The group of spines consists of 20–24 spines in a double row. The spines of the posterior row are longer, but the lateral spines are not longer than the median ones.

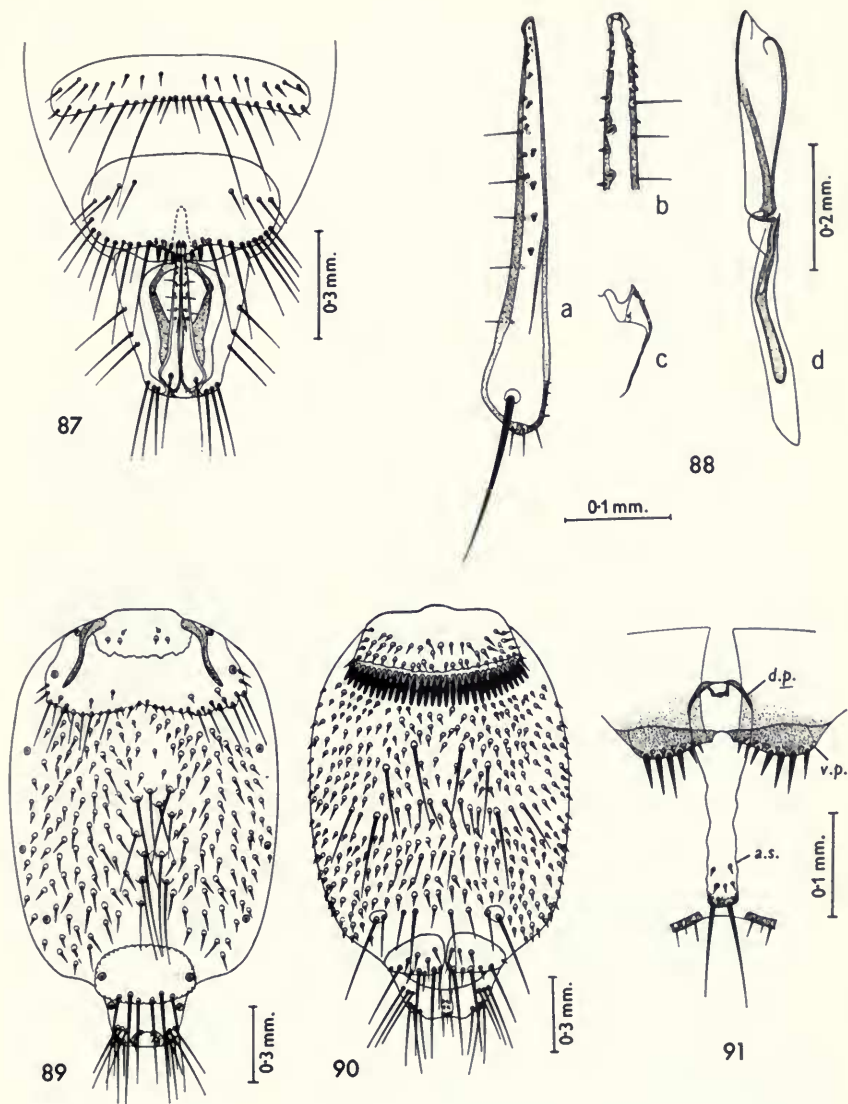
Genitalia: Aedeagus curved, tapering to a point, without dorsal tooth, triangular in dorsal view. Ventral teeth only in basal third, in two lateral groups. Parameres slender, much longer than in *P. oligacantha*, with a pointed tip and small hairs along the dorsal edge and along the sides.

Holotype.—A male from Miatan Cave, Katipunan, Zamboanga, Mindanao, from a mixed collection of *Miniopterus schreibersi eschscholtzii* and *Rhinolophus arcuatus exiguus*, collected May 19, 1952, by D. S. Rabor. In the collection of Chicago Natural History Museum.

Allotype.—A female, same data and repository as the type.

Paratypes.—Three males and three females, same data as the holotype. A female, same data as the holotype, but from *Emballonura alecto*. Two males and 3 females from Luangbay Cave, Sitio Tegato, Davao, Mindanao, from a mixed collection of *Miniopterus schreibersi eschscholtzii* and *M. australis*, collected October 22, 1946, by H. Hoogstraal. A male and 2 females, same data, but on bat dung in cave. In the author's collection and that of Chicago Natural History Museum.

Other material examined.—Five males, 5 females, from Tablas Island, collected from *Miniopterus schreibersi eschscholtzii*, January, 1923, by E. H. Taylor. A female, from Pagsanjan Falls, Luzon, from



FIGS. 87-91. *Eucampsipoda philippinensis* Ferris. (87) Abdomen of male, posterior part, ventral aspect. (88) Genitalia of male; *a*, clasper, dorsal aspect; *b*, clasper, profile; *c*, paramere; *d*, aedeagus. (89, 90) Abdomen of female, dorsal and ventral aspects, respectively. (91) Genital plates of female; *a.s.*, anal sclerites; *d.p.*, dorsal plate; *v.p.*, ventral plate. (After Theodor, 1955.)

a mixed collection of *Miniopterus schreibersi eschscholtzii* and *Chaerophon luzonus*, collected by E. H. Taylor. A female, from Lubang Island near Mindoro, from *Miniopterus tristis*.

Remarks.—Both *P. oligacantha* and *P. oceanica acuminata* were found together in some of the localities in about equal numbers. Only the isolated occurrence of *P. acuminata* in a widely separated locality—Zamboanga at the tip of the southwest peninsula of Mindanao—and a minor chaetotactic character (the single or double row of setae at the anterior ventral margin of the head), made it possible to decide which male and female belong together.

Genus EUCAMPSIPODA Kolenati, 1857

In 1924 Ferris described *Eucampsipoda philippinensis*. Unfortunately, he did not realize that there are 3 species of *Eucampsipoda* in the Philippines and that the female and male of his description belong to different species. Theodor (1955), in a revision of the genus, gave full descriptions and a key for the species of the genus. The female described by Ferris is considered as the type of *E. philippinensis*. This species is at present known only from the Philippines, while the other two species are widely distributed in the Oriental Region. The male described by Ferris is that of *E. sundaicum*. In the same paper Ferris refers to specimens from Ceylon as *Eucampsipoda hyrtlui*. This is not correct. *E. hyrtlui* is restricted to the Middle East and the specimens from Ceylon are *E. latisternum*.

In the present paper a key and figures for the Philippine species are given.

***Eucampsipoda philippinensis* Ferris. Figures 87–91.**

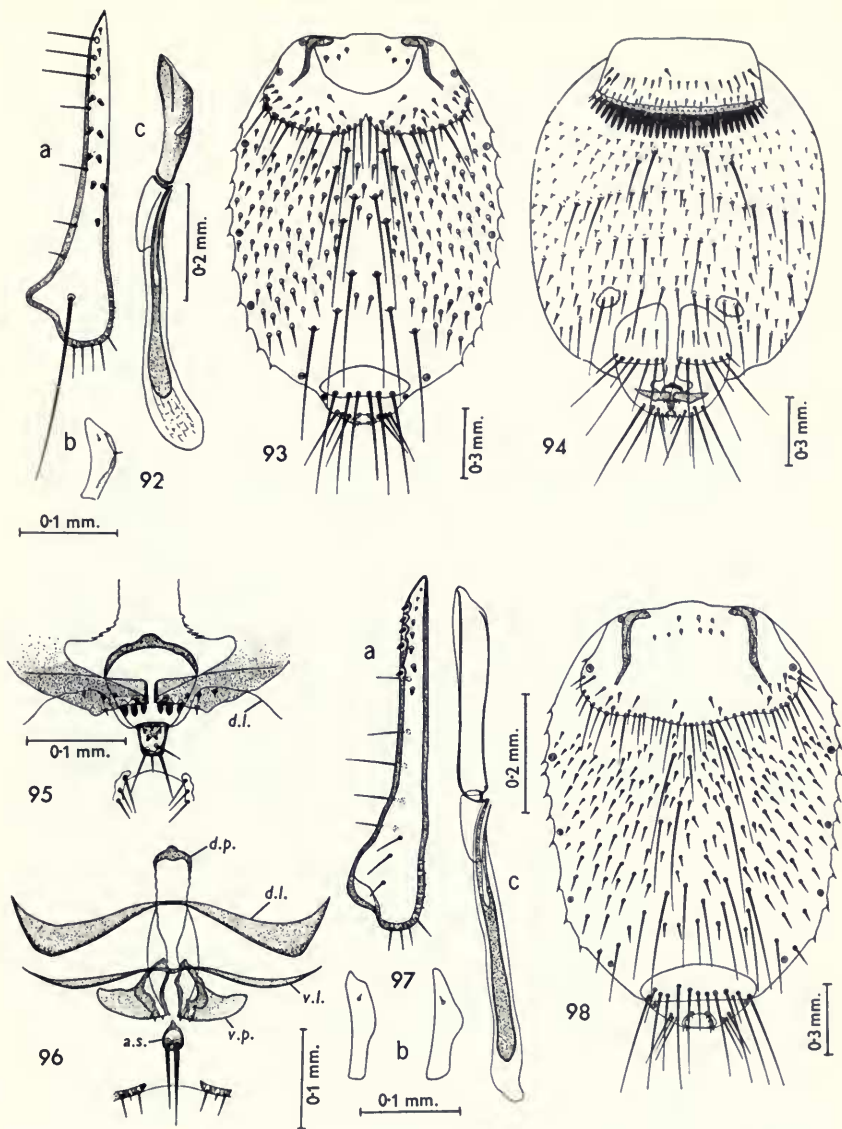
Eucampsipoda philippinensis Ferris, 1924 (pro parte), Phil. Jour. Sci., 24: 76, fig. 3a, b (♀); Theodor, 1955, Parasitology, 45: 210, figs. 24–28 (Luzon: Montalban). Natural History Museum, Stanford University.

Philippine material examined.—Thirty specimens from Cotabato City, Cotabato Province, Mindanao, from *Eonycteris robusta*, December 27, 1946, collected by F. Werner; 38 specimens, same locality, from *Hipposideros diadema griseus*, December 26, 1946, collected by F. Werner.

***Eucampsipoda sundaicum* Theodor. Figures 92–95.**

Eucampsipoda sundaicum Theodor, 1955, Parasitology, 45: 213, figs. 29–32 (Burma: Tenasserim). Museo Civico di Storia Naturale, Genoa.

Eucampsipoda philippinensis Ferris, 1924 (pro parte), Phil. Jour. Sci., 24: 76, fig. 3c, d (♂).



FIGS. 92-95. *Eucampsipoda sundaicum* Theodor. (92) Genitalia of male; a, clasper; b, paramere; c, aedeagus. (93, 94) Abdomen of female, dorsal and ventral aspects, respectively. (95) Genital plates of female; d.l., dorsal lip. (After Theodor, 1955.)

FIGS. 96-98. *Eucampsipoda inermis* Theodor. (96) Genital plates of female; v.l., ventral lip; d.l., dorsal lip; d.p., dorsal plate; v.p., ventral plate. (97) Genitalia of male; a, clasper; b, paramere; c, aedeagus. (98) Abdomen of female, dorsal aspect. (After Theodor, 1955.)

Distribution.—Burma (Tenasserim), India (Madras), Sumatra, Malaya (Selangor), Philippines.

Philippine material examined.—A female from Nazareto Cave, Calapan, Mindanao. Eighteen specimens from Tanabog, Puerto Princesa, Palawan, from *Eonycteris spelaea glandifera*, collected March 17, 1947, by F. Werner. Thirty specimens from Luangbay Cave, Sitio Tegato, Davao City Province, Mindanao, from *Rousettus amplexicaudatus* and *Eonycteris spelaea glandifera*, collected October 22, 1946, by H. Hoogstraal. Three females from Montalban, Rizal Province, Luzon, collected by E. H. Taylor.

Eucampsipoda inermis Theodor. Figures 96–98.

Eucampsipoda inermis Theodor, 1955, *Parasitology*, 45: 215, figs. 33–35 (Samar: Soribao, Borongan). British Museum (Natural History).

Distribution.—Java; Philippines; Thailand; New Guinea.

Philippine material examined.—Three males and two females from Soribao, Borongan, Samar Island, collected from “dog-faced bats,” i.e., either *Rousettus* or *Eonycteris* according to Hoogstraal (1951, p. 39), June 20, 1948, by A. P. Castro and P. Anonuevo. Type series in British Museum (Natural History). Fifty specimens from Luangbay Cave, Sitio Tegato, Davao City Province, Mindanao, from *Rousettus amplexicaudatus* and *Eonycteris spelaea glandifera*, collected October 22, 1946, by H. Hoogstraal. A female, same locality and date, from *R. amplexicaudatus*. Three males and a female from Siaton, Negros Island, from *R. amplexicaudatus*, collected August 8, 1952, by D. S. Rabor. Four males, one female from Nazareto Cave, near Calapan, Mindanao (from collection of J. Bequaert). About fifty specimens from Tawang Cave, Samal Island, Davao Province, collected December 2, 1946, by D. Heyneman and A. Celestino. All the above specimens are paratypes.

KEY TO PHILIPPINE SPECIES OF THE GENUS EUCAMPSIPODA

Males

1. A group of 6–8 strong short spines at the apex of sternite 5.
 - E. philippinensis* Ferris
 - Only thin hairs at the apex of sternite 5 2
2. Claspers 0.38 mm. long. No long seta dorsally near the base of the clasper, but 2–3 short setae. Pegs arranged in 2 rows from the tip to before the middle of the clasper. Pegs of the outer row large, those of the inner row smaller near the tip. A row of hairs begins near the fourth lateral peg and the hairs become longer basally. Aedeagus 0.35 mm. long, 8 times as long as wide at the base. Abdominal ctenidium with 36 spines.
 - E. inermis* Theodor

Claspers shorter, 0.3 mm. long. A long seta dorsally near the base. Pegs large, arranged in 2 equal rows from the apical to the basal third of the clasper. Hairs longest near the tip, anterior to the pegs. Aedeagus short, 0.23 mm., 5 times as long as wide at the base and markedly wider apically. Abdominal ctenidium with 28-30 spines. *E. sundaicum* Theodor

Females

1. Tergite 6 narrow, with a row of 12-14 long setae posteriorly. Abdominal ctenidium with 36 spines. Dorsal genital plate very narrow, twice or three times as long as wide. Ventral plate triangular, with only 1-3 very small spines at the inner dorsal corners. A dorsal and a ventral lip present. Anal sclerite small, drop-shaped, isolated, with only 2 long setae.

E. inermis Theodor

Tergite 6 with a row of only 6-8 long setae posteriorly. Abdominal ctenidium with 28-33 spines. 2

2. Setae in the middle of the hind margin of tergite 2 long. Spiracles of segment 6 lie outside the tergite. The group of 10-16 very long setae on the dorsum of the abdomen begins close to tergite 1+2 and broadens posteriorly. Dorsal genital plate broadly rounded, as wide as long. Ventral plates triangular, with 2-3 thick pegs at the inner dorsal corner and a second row of small spines. Anal sclerite square, with 2-3 long setae at the end and several pegs or spines on the surface. Dorsal lip divided into lateral flaps which do not cover the ventral plates. Anal segment short with one group of setae near the anus. *E. sundaicum* Theodor

Setae in the middle of the hind margin of tergites 1 and 2 short. Spiracles of segment 6 lie inside the tergite. The group of 8-12 moderately long setae on the dorsum of the abdomen begins at a distance from tergite 1+2, does not broaden posteriorly and ends usually before the hind margin of the spinose area. Anal segment rather long, with 2 rows of long setae, hollowed out ventrally. Dorsal genital plate rounded, small, fused with the long and narrow anal sclerite into a spoon-shaped structure. Dorsal lip absent. Ventral plates triangular, with a row of setae which are shorter in the middle.

E. philippinensis Ferris

Genus CYCLOPODIA Kolenati, 1863

Subgenus Cyclopodia Kolenati s. str.

Cyclopodia horsfieldi de Meijere. Figure 99.

Cyclopodia horsfieldi de Meijere, 1899, Tijds. Ent., 42: 153, fig. 1; Speiser, 1901, Arch. Naturg., 67: 51; Scott, 1917, Parasitology, 9: 607; Ferris, 1925, Phil. Jour. Sci., 27: 413, fig. 1; Theodor, 1959, Parasitology, 45: 252, figs. 10, 11.

Ferris (1925) recorded the species from the Philippines and gave new figures. Theodor (1959) re-described the species and gave figures of some additional structures.

The essential characters of the species are as follows:

Length 4-5 mm. Color dark brown. Head dorsally covered with short hairs. Haltere grooves covered. 2-3 notopleural setae. Abdomen of male with the marginal rows of the tergites interrupted in the middle. Sternite 5 with a row of about 10 short barrel-shaped spines in the middle of the hind margin. Male genitalia: Phallobase with a long apical hook. Aedeagus rod 1.3-1.5 mm. long. The field of spines on the connecting tube of the aedeagus as long as the aedeagus rod.

Abdomen of female: Spiracles large, 100–110 μ . A group of 4 or 5 large spines on a bare area in the middle of the dorsum. The posterior third of the abdomen between spiracles 5 and 6 is covered with 3–4 rows of very long setae which reach laterally farther beyond the spiracles than in *C. sykesii*. This group continues anteriorly in a median stripe which reaches the anterior group of large spines in some specimens, but not in others. The setae on the anterior part of the pleurae, anterior and ventral of spiracle 4 are longer than those on the posterior part of the pleurae and on the venter. Genital plate H-shaped, bearing about 10 spines at the posterior broadened parts of the H.

The main character on which *C. horsfieldi* is separated as a rule from the closely related *C. sykesii* is the arrangement of the long setae on the posterior part of the dorsum of the abdomen of the female. In *C. sykesii* the anterior group of spines is separated from the posterior group of setae by a number of rows of minute spines while in *C. horsfieldi* the posterior group is stated to extend forward in a median stripe, reaching the anterior group. In addition there are longer setae at the pleurae, ventral to spiracles 4 and 5, while in *C. sykesii* the spines at this point are short. Ferris (loc. cit.) has remarked on the variability of the forward extension of the long setae. Examination of a large number of *C. horsfieldi* from the Philippines showed that this character is not reliable. Of 125 females examined, 25 per cent had the anterior group separated from the posterior group by a varying number of rows of small spines, in some specimens to such a degree that they could have been identified as *C. sykesii* on this character. In 33 per cent the anterior group was separated by a reduced number of spines and in 40 per cent the posterior group either reached the anterior group or was separated by a bare area. There were all variations between an arrangement as in *C. sykesii* and a median stripe of long setae reaching up to the anterior spines. On the other hand, the number of long setae in *C. horsfieldi* is always smaller than in *C. sykesii*. There are only 3–4 rows of more widely spaced setae as against about 6 rows of more closely standing setae in *C. sykesii*. Furthermore, the long setae on the pleurae have not been seen in any specimens of *C. sykesii* examined.

The males of both species are indistinguishable and some of the differences between the females are variable as shown above. The distribution of both forms is clearly separated as far as our knowledge goes and it may therefore be justifiable to consider *C. horsfieldi* as a subspecies of *C. sykesii*. But more material, particularly from the part of India where both species may occur together, i.e., Assam and Burma, must be examined before this can be decided.

Distribution.—Throughout the Malaysian Region, mainly on *Pteropus vampyrus* and its subspecies.

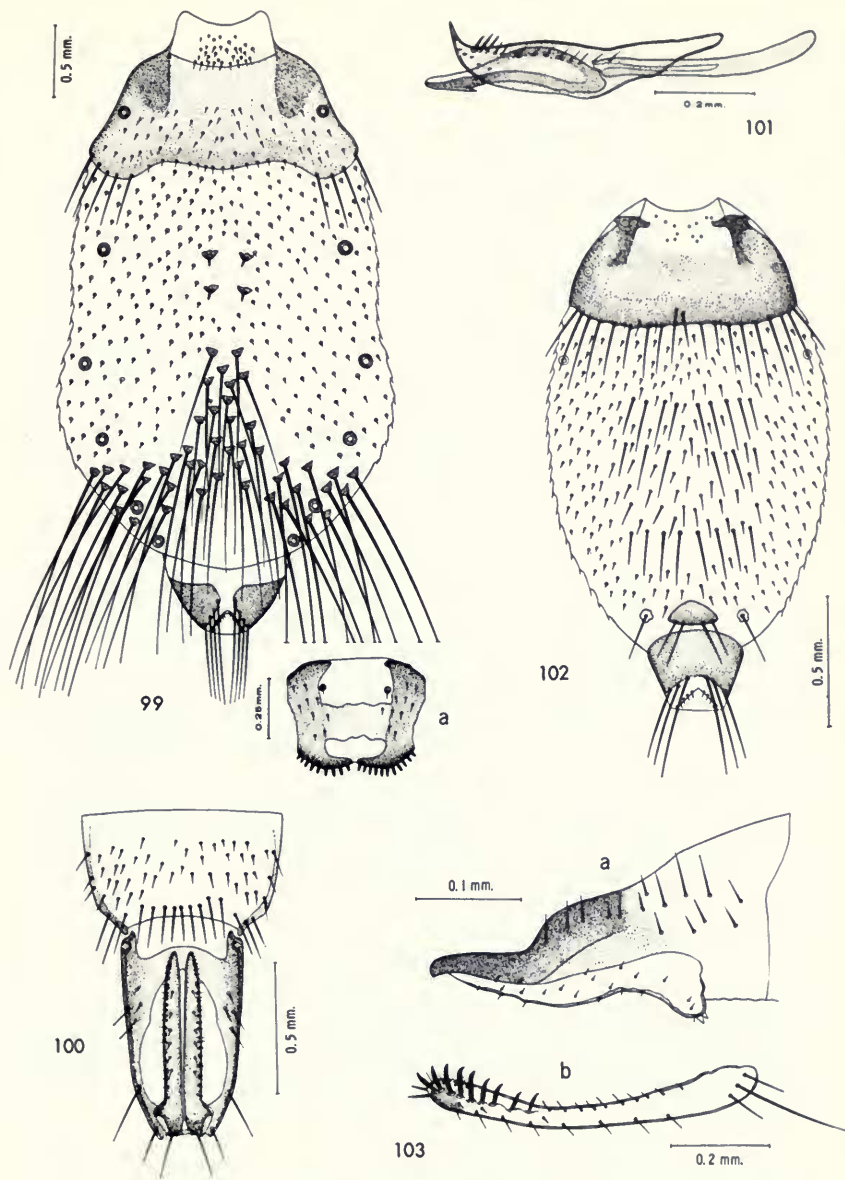


FIG. 99. *Cyclopodia horsfieldi* de Meijere; abdomen of female, dorsal aspect; a, genital plate.

FIGS. 100-101. *Cyclopodia similans* Theodor, male. (100) Sternite 5 and genital area. (101) Genitalia.

FIGS. 102-103. *Cyclopodia ferrarii palawanensis* Theodor. (102) Abdomen of female, dorsal aspect. (103) Male: a, phallobase, lateral aspect; b, clasper, ventral aspect.

Philippine material examined.—MINDANAO ISLAND: About 95 specimens, Tugunay, Tagum, Davao Province, collected from *Acerodon jubatus mindanensis*, November 20, 1946, by A. Castro; 20 specimens, Madaum, Tagum, Davao Province, collected from *A. jubatus mindanensis*, October 9–10, 1946, by F. Werner and A. Castro; 8 specimens, same locality and collectors, from *Pteropus vampyrus lanensis*, October 9, 1946; 4 specimens, Malalag, Santa Cruz, Davao, collected from *Pteropus* sp., November 28, 1946, by F. Werner; 10 specimens, Sinaksakan (near Todaya), Mount Apo, Davao, collected from *A. j. mindanensis*, November 21, 1946, by H. Hoogstraal and M. Celestino; 11 specimens, Lacaron, Malita, Davao, collected from *A. j. mindanensis* and *Pteropus vampyrus lanensis*, February 6, 1947, by F. Werner; 7 specimens, Parang, Cotabato Province, collected from *A. j. mindanensis*, December 12, 1946, by F. Werner.

PALAWAN PROVINCE: Puerto Princesa, Palawan Island, 23 specimens from *Pteropus vampyrus lanensis*, collected April 8 and 11, 1947, by H. Hoogstraal; Cañon Island, near Puerto Princesa, 62 specimens from *P. v. lanensis*, collected April 17, 1947, by H. Hoogstraal; Cuyo Island, 32 specimens from *Pteropus hypomelanus cagayanus*, collected April 27 and May 26, 1947, by A. Castro.

NEGROS ISLAND: Panaqui Tag, La Carlota, six specimens from *Pteropus philippinensis* (synonym of *Rousettus amplexicaudatus*), collected November 8, 1911 (M. B. Mitzmain).

In addition, Ferris (1925) gives the following Philippine localities and hosts: Malanipa, Zamboanga, *Pteropus speciosus* (E. H. Taylor); Bangui, Luzon, *Pteropus* sp. (McGregor).

Subgenus **Leptocyclopodia** Theodor, 1959

Type of the subgenus.—*Cyclopodia ferrarii* Rondani, 1878.

A discussion of the reasons for the creation of this subgenus and a full diagnosis are given in a revision of the genus *Cyclopodia* (Theodor, 1959, p. 284).

A shortened diagnosis is as follows:

Slender insects with long and narrow anal segment in the male. Abdominal tergites of the male with continuous marginal rows of setae. Tergite 5 as long as or longer than tergite 4. No row of spines at the hind margin of sternite 5. Claspers with or without armature of spines. Aedeagus completely or partly sclerotized, with a long apodeme. Post-spiracular sclerite without or with small spines. Segmentation of the female abdomen less reduced than in the sub-

genus *Cyclopodia*. Rows of setae present at the posterior margin of some segments. Sclerites present on tergite 6 and on sternites 5-7 or 6-7. Sternite 7 not transformed into genital plate.

***Cyclopodia ferrarii palawanensis* Theodor. Figures 102-103.**

Cyclopodia ferrarii palawanensis Theodor, 1959, *Parasitology*, 49: 288, figs. 56, 57 c, f (Puerto Princesa, Palawan). Chicago Natural History Museum.

A full description of *Cyclopodia ferrarii* and the subspecies *palawanensis* has been given in the revision of the genus cited above. The subspecies differs from the typical form in the presence of longer setae in the posterior rows of the segments on the dorsum of the female. Such rows are most clearly marked in the marginal row of tergites 3 and 5. In the typical form the short spines of the dorsum are longer posteriorly and the marginal row of tergite 5 may consist of spines longer than the surrounding ones, but there are no long setae. In the male the phallobase and parameres are of different shape. The anterior hook of the phallobase is longer and stouter and more strongly curved upward. The parameres are longer and less strongly concave ventrally. The row of spines on the ventral surface of the clasper consists of 10-12 spines which are all thick and blunt, but become smaller towards the base. In the typical form, the basal spines are much thinner and more pointed than the apical ones.

Material examined.—The original type series (all from *Cynopterus brachyotis luzoniensis*) as follows:

Holotype, allotype and 60 paratypes from Puerto Princesa, Palawan Island, collected May 11, 1947, by H. Hoogstraal and F. Werner; 16 paratypes from Brooke's Point, Palawan Island, collected April 24-May 14, 1947, by M. Celestino; 5 paratypes from Iwahig, Palawan Island, collected May 1, 1947, by H. Hoogstraal; 22 paratypes from Singay, Busuanga Island, Calamianes Group, Palawan Province, collected March 13, 1947, by H. Hoogstraal; 6 paratypes from Culion Island, San Pedro, collected March 31-April 1, 1947, by H. Hoogstraal.

***Cyclopodia simulans* Theodor. Figures 100-101.**

Cyclopodia simulans Theodor, 1959, *Parasitology*, 49: 292, figs. 63-64 (Mindanao: Todaya, Mount Apo). Chicago Natural History Museum.

This species resembles *C. ferrarii* closely in chaetotaxy and the structure of the body but differs markedly in the form of the claspers and the genitalia, as shown in the figures.

DESCRIPTION.—Length 3 mm. Color yellowish brown. *Head*. Vertex bare. 2 long setae at the anterior dorsal margin. Eyes with incompletely separated

ocelli with large lenses on a common shallow pigmented base. Palps with a thick base, tapering towards the tip, with a moderately long terminal seta and 4-5 short setae along the edge. Labella of labium slightly longer than the theca. 3 minute spines at the posterior margin of the theca in each half.

Thorax slightly wider than long. 2 notopleural setae. Oblique sutures forming an angle of 90°. Otherwise much as in *C. ferrarii*. Legs shorter than in *C. ferrarii*, tibiae more spindle-shaped.

TABLE 1.—MEASUREMENTS OF LEGS
(In millimeters)

	Femur			Tibia			Metatarsus			Leg		
	1	2	3	1	2	3	1	2	3	1	2	3
<i>C. ferrarii</i> . . .	0.97	1.04	1.07	0.97	1.00	1.00	0.83	0.77	0.65	3.07	3.02	3.10
<i>C. simulans</i> . . .	0.82	0.95	0.97	0.80	0.83	0.85	0.58	0.58	0.55	2.50	2.67	2.66

Abdomen of male: Similar to that of *C. ferrarii*. Post-spiracular sclerite without spines. There is a double row of about 20 short spines on the surface of tergite 2 near the marginal row. Anal segment slender, shorter than in *C. ferrarii*, tapering slightly, twice as long as wide at the base. Some short setae on the lateral posterior part of the dorsal surface, a transverse row of 4 longer setae a short distance before the hind margin and a row of 8 setae at the hind margin.

Genitalia: Claspers slender, tapering to a blunt point. A long and 2 short setae dorsally near the base. A row of minute hairs along the outer edge and a row of short spines on the dorsal surface near the outer edge. The row of spines characteristic for *C. ferrarii* is absent. Phallobase bifid at the tip with upturned ends and a row of spines, which are thicker anteriorly, along the outer edge of the phallobase. Basal arc triangular, fused with the phallobase. Parameres also fused with the phallobase, with 1-2 rows of minute spines. Aedeagus wholly sclerotized, curved, tapering to a rounded point and with a small ventral tooth near the tip. Apodeme slender, as long as the aedeagus.

Female unknown.

Material examined.—The male holotype and paratype from Todaya, Mount Apo, Mindanao, collected from *Ptenochirus jagori* October 22, 1946, by G. Alcasid.

DISTRIBUTION AND HOST-PARASITE SPECIFICITY

The Chiroptera collected by the Philippine Zoological Expedition have been reported on by C. C. Sanborn (1952). He gives details of 921 specimens of which 346 are Megachiroptera and 575 Microchiroptera. The Megachiroptera belong to 13 species and 2 subspecies and the Microchiroptera to 24 species.

Nycteribiids were found on 9 species of Megachiroptera and on only 6 species of Microchiroptera. In addition, Ferris (1925) mentions another species of *Pteropus* as host and gives a record (1924b)

from a mixed series of *Miniopterus schreibersi eschscholtzii* and *Chaerophon luzonus*, so that the latter species must be considered as a possible host.

The Nycteribiidae collected from these bats and in caves consist of about 700 specimens belonging to 15 species. In spite of this large material our knowledge of the distribution of the Nycteribiidae in the Philippines remains incomplete, mainly because the collecting activities of the expedition were concentrated in a few areas: the northern part of Luzon, the southern part of Mindanao, Palawan, and the adjacent islands of Culion, Busuanga and Cuyo. In addition, some material was collected on Negros Island and the Zamboanga peninsula of Mindanao by D. S. Rabor. There is thus little material from the greater part of the Philippines outside the areas mentioned.

The bat fauna of the Philippines is predominantly Malaysian. Most species occurring in the Philippines are widely distributed throughout the Malaysian Region, some extending into the Australian Region. A few have a more restricted distribution in the Philippines and the Celebes-Moluccas area and a few are endemic in the Philippines. There seems to be no Australian element. The Nycteribiid fauna is constituted accordingly. A number of species widely distributed in the Malaysian Region occur throughout the Philippines. Some of these, e.g., *C. horsfieldi*, occur in the typical form, others have begun to develop local forms, e.g., *N. allotopa* and *N. parvula*. Some of these local forms are closely related to the typical species and could be regarded as subspecies; others have changed further and occur together with the other forms so that they have to be considered as species (*N. allotopoides* and *N. parvuloides*).

Basilisa majuscula is widely distributed throughout the Oriental Region, from India to Java. To date it has been found in the Philippines only in the Palawan area. However, its specific host, *Pipistrellus imbricatus*, has been found on Negros Island also, so that it may prove to be more widely distributed.

Cyclopodia ferrarii palawanensis has also been found only on Palawan and adjacent islands, but its specific host, *Cynopterus brachyotis luzoniensis*, is widely distributed throughout the Philippines, from Luzon to Mindanao. Of the 65 specimens collected, 62 were collected in the Palawan area and only 3 in Mindanao, and these had no parasites. It is thus not clear whether *C. ferrarii palawanensis* is really restricted to the Palawan area or whether collectors have failed to obtain it outside the area.

TABLE 2.—HOST-PARASITE RELATIONSHIPS OF NYCTERIBIIDAE

		MEGACHIROPTERA								
		<i>Pteropus vampyrus lanensis</i>	<i>Pteropus hypomelanus cagayanus</i>	<i>Pteropus speciosus</i>	<i>Acerodon jubatus mindanensis</i>	<i>Cynopterus brachyotis luzoniensis</i>	<i>Rousettus amplexicaudatus</i>	<i>Eonycteris spelaea glandifera</i>	<i>Eonycteris robusta</i>	<i>Ptenochirus jagori</i>
No. 2 of bats	.....	51	7	1	23	65	55	44	51	7
PARASITES										
<i>Nycteribia</i>	{	<i>allotopa</i>.....	..	..	..	..	..	..	..	..
		<i>allotopoides</i>.....	..	..	..	..	..	..	..	..
		<i>parvula</i>.....	..	..	..	..	..	..	..	..
		<i>parvuloides</i>.....	..	..	..	..	..	1	..	..
<i>Penicillidia</i>	{	<i>oligacantha</i>.....	..	..	..	..	1	..	..
		<i>oceanica acuminata</i>.....	..	..	..	..	1	..	..
<i>Basilisa</i>	{	<i>majuscula</i>.....	..	..	..	..	..	..	..
<i>Eucampsipoda</i>	{	<i>philippinensis</i>.....	..	..	..	..	..	..	30	..
		<i>sundaicum</i>.....	..	..	..	..	..	32	..	..
		<i>inermis</i>.....	..	..	..	..	..	18	..	..
<i>Cyclopodia</i>	{	<i>horsfieldi</i>	99	32	+	138	..	6	..	..
		<i>ferrarii palawanensis</i>...	..	..	..	..	115	..	..	..
		<i>simulans</i>.....	..	..	..	..	..	..	..	2

TABLE 2.—HOST-PARASITE RELATIONSHIPS OF NYCTERIBIIDAE (continued)

	MICROCHIROPTERA									
	<i>Emballonura alecto</i>	<i>Rhinolophus arcuatus eriguis</i>	<i>Hipposideros diadema griseus</i>	<i>Pipistrellus imbricatus</i>	<i>Miniopterus australis</i>	<i>Miniopterus schreibersi eschscholtzi</i>	<i>Miniopterus tristis</i>	<i>Chaerephon luzonius</i>		
No. of bats.....	13	102	57	6	73	84	1	..		
PARASITES										
<i>Nycteribia</i>	{	<i>allotopa</i>.....	..	..	..	7	6	..	..
		<i>allotopoides</i>.....	..	..	..	3	..	..	..
		<i>parvula</i>.....	..	1	..	..	2	3	..	?
		<i>parvuloides</i>.....	..	..	..	..	5	..	..	..
<i>Penicillidia</i>	{	<i>oligacantha</i>.....	..	1	..	..	5	19	..	..
		<i>oceanica acuminata</i>	1	7	..	..	5	10	1	?
<i>Basilisa</i>	{	<i>majuscula</i>.....	..	..	..	8	..	..	..
<i>Eucampsiopoda</i> ..	{	<i>philippinensis</i>.....	..	..	38	..	..	..	..	..
		<i>sundaicum</i>.....	..	..	..	..	..	..	..	..
		<i>inermis</i>.....	..	..	..	..	..	..	..	..
<i>Cyclopodia</i>	{	<i>horsfieldi</i>.....	..	..	..	..	..	..	..	..
		<i>ferrarii palawanensis</i>..	..	..	..	..	..	..	..	..
		<i>simulans</i>.....	..	..	..	..	..	..	..	..

Figures indicate number of specimens found on each species of bat.
 Brackets indicate records from mixed series.

The fauna of Palawan apparently differs markedly from that of the rest of the Philippines. Hoogstraal (1951) remarks that the islands of the Palawan group "are of intense interest because of their close biological affinities to Borneo and their great dissimilarity from the rest of the Philippines" and "the Calamianes group . . . carries the Palawan fauna to its northern limits. . . . Possibly a very small fraction of the fauna has extended itself north to nearby Mindoro island."

Mayr (*in litt.*) states that "Palawan belongs zoo-geographically to Malaysia. It is the only island of the 'Philippines' which is set on the Sunda shelf and thus it was connected with Borneo during most of the Pleistocene."

Should it be proved that *C. ferrarii palawanensis* does not occur in the Philippines outside the Palawan area, although its host is widely distributed throughout the Philippines, this would be another instance of the distribution of a parasite being more restricted than that of its host. Several instances of such a restricted distribution of Nycteribiidae in the Ethiopian Region have been given recently (Theodor, 1957).

Penicillidia jenynsii and *P. dufourii tainani*, both of which occur on Formosa, do not occur in the Philippines, although their principal host, *Miniopterus schreibersi*, does occur there. One of the two new *Penicillidia* (*oligacantha*) described here is related to *jenynsii*, but has a more closely related form in Sumatra, while the other is a new subspecies of *P. oceanica*. The nominate subspecies occurs in Australia and New Caledonia.

One species of *Eucampsipoda* (*philippinensis*) is known so far only from the Philippines; the other two species are more or less widely distributed in the Oriental Region.

The host-parasite relationships of the Philippine Nycteribiids are summarized in Table 2. The restriction of the genera *Nycteribia*, *Basilia* and *Penicillidia* to Microchiroptera is clearly shown as well as the restriction of the genera *Eucampsipoda* and *Cyclopodia* to the Megachiroptera. The only exception is *E. philippinensis*, which was found equally common on *Eonycteris robusta* and *Hipposideros diadema griseus* in the same locality.

C. horsfieldi is a parasite of the genus *Pteropus* in the Oriental Region. In the Philippines it has been found on three species of *Pteropus*, the closely related *Acerodon*, and *Rousettus amplexicaudatus*. *C. ferrarii* is a nearly specific parasite of the genus *Cynopterus*

throughout the Oriental Region and in the Philippines all specimens of the subspecies *palawanensis* were found on *Cynoptyrus brachyotis luzoniensis*.

The two specimens of *Cyclopodia simulans* were found on *Ptenochirus jagori*, a species endemic in the Philippines, and *C. simulans* may thus also prove to be endemic.

The genus *Eucampsipoda* is normally parasitic on Megachiroptera and particularly on the genus *Rousettus*. In the Philippines two species were found on *Rousettus* and *Eonycteris*, but one species was found to be equally common on *Eonycteris* and *Hipposideros*.

The species of *Nycteribia* and *Penicillidia* were found to be mainly parasites of species of *Miniopterus*, as they are outside the Philippines. Only a single specimen of *P. acuminata* was found on *Emballonura alecto*. Ferris gives records of three species, *N. allotopa*, *N. parvula* and *P. jenynsii*, from a mixed series of *Miniopterus schreibersi eschscholtzii* and *Chaerephon luzonus*. (The specimens of *P. oceanica acuminata*.) *C. luzonus* has therefore been included in the table as a doubtful host, as species of *Miniopterus* are without a doubt the main host of these species of Nycteribiidae. Only a single straggler each of *Penicillidia oligacantha* and of *Nycteribia parvuloides* was found on a mixed series of *Eonycteris* and *Rousettus*. The record of *P. oceanica acuminata* from *Miniopterus tristis* is taken from Ferris (1924b) and not from the specimen caught by the expedition.

Basilisa majuscula belongs to the *bathybothyra* group of the genus, most species of which are parasites of the genus *Pipistrellus* in the Ethiopian and Oriental Regions. All Philippine specimens were found on *Pipistrellus imbricatus*.

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